CSBP Ammonia Expansion Project

Referral of a Proposal under Section 38 of the Environmental Protection Act 1986

Referral Supporting Information Document

Rev.	Change Details	Author	Reviewer	Approver	Date
0	Issued for referral	C Ingram	J Bailes	D Thompson	5 Dec 2022

Table of contents

List of Tables

List of Figures

Appendices

Abbreviations

Term	Definition
AP1	CSBP Ammonia Plant 1
AP2	CSBP Ammonia Plant 2
AP3	Proposed CSBP Ammonia Plant 3
ARI	Assessed on Referral Information
BOM	Bureau of Meteorology
CoK	City of Kwinana
CSBP Kwinana	CSBP Kwinana Industrial Complex
DSI	Detailed Site Investigation
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EQC	Environmental quality criteria
EQO	Environmental Quality Objectives
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986 (WA)
FEED	Front-end engineering design
GHG	Greenhouse gas
GHGMP	Greenhouse Gas Management Plan
JDAP	Joint Development Assessment Panel
KIC	Kwinana Industries Council
ktpa	Thousand tonnes per annum
KWRP	Kwinana Water Reclamation Plant
mBGL	Metres below ground level
m/d	Meters per day (Hydraulic conductivity unit)
ML	Megalitres
MS	Ministerial Statement
REC	Renewable Energy Certificate
RIWI Act	Rights in Water and Irrigation Act 1914
SDOOL	Sepia Depression Ocean Outlet Landline
SWIS	South West Interconnected System
t CO_2-e	tonnes CO_2-equivalents
tpa	Tonnes per annum
tpd	Tonnes per day

Executive summary

CSBP Limited (CSBP; the Proponent) is proposing to construct a new ammonia plant at its existing facility in Kwinana, Western Australia (the Proposal). The Proposal will increase CSBP's ammonia production capacity by 300,000 tonnes per annum, which will reduce the reliance on third-party ammonia imports.

The Proposal is being referred to the Environmental Protection Authority (EPA) under section 38 of the *Environmental Protection Act 1986* (EP Act). An assessment of the Proposal against the EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b) has determined that the following environmental factors could be potentially impacted:

- Marine Environmental Quality;
- Air Quality;
- Greenhouse Gas Emissions; and
- Social Surroundings.

The key characteristics of the Proposal are detailed in the following tables in accordance with EPA instructions on how to identify the contents of a proposal (EPA, 2021).

Table ES.1: General proposal content description

Proposal title	Ammonia Expansion Project
Proponent name	CSBP Limited
Short description	The Proposal is for the construction and operation of a new ammonia plant within the CSBP Kwinana Industrial Complex in the Kwinana Industrial Area (KIA), approximately 40 km south of the Perth Central Business District (CBD) (Figure 1.1). The Proposal will use natural gas sourced from the Dampier to Bunbury Natural Gas Pipeline (DBNGP), integrated with hydrogen production from a 10-megawatt (MW) electrolyser, to manufacture ammonia, which will then be used by CSBP for the manufacture of other chemical products or sold externally to customers. The Proposal will be a self-sustained facility with a production capacity of approximately 300,000 tonnes per annum (tpa) and will be integrated with a number of existing CSBP facilities located in the KIA (Figure 2.2).

Table ES.2: Proposal content elements

Proposal element	Location/description	Maximum extent, capacity, or range
Physical elements		
Overall extent of the Proposal	Figure 2.1	Development Envelope of 27.52 ha, including less than 1 ha of clearing, within the 138 ha CSBP Kwinana Industrial Complex.
Ammonia plant		300,000 tonnes per annum nominal capacity
Utilities		Including: • 10 MW electrolyser for hydrogen production; • Natural gas fuelled steam boiler; • Water purification units; • Cooling water tower; • Flare; and • Other utilities.
Infrastructure and logistics buildings		Including: • Existing control room modification; • Office and maintenance workshop relocation; and • Ammonium nitrate storage dome shelter relocation.
Construction elements		
Laydown area, carpark, and roads	Figure 2.1	Approximately 7 ha of temporary facilities to support construction of the Proposal.

Proposal element	Location/description	Maximum extent, capacity, or range
Operational elements		
Gas supply (natural gas)	N/A	Nominal 27 TJ per day via gas pipeline.
Power supply		Internal generation of up to 11 MW from process waste heat. Connection to the South West Interconnected System (SWIS) for supply of up to 5.6 MW electricity and purchase of equivalent renewable energy certificates (REC) for the electrolyser.
Water supply		Approximately 1,610 ML per annum.
Liquid effluent		Liquid effluent will be collected and processed through existing nutrient stripping wetlands, or new water treatment plant, at CSBP Kwinana prior to being pumped offsite to the Sepia Depression Ocean Outlet Landline (SDOOL), Cockburn sounds diffuser or emergency beach outflow. Conditions on effluent concentrations will be in line with existing licence conditions.
Solid waste		Solid waste including water treatment residue and spent catalyst/resins directed to appropriate disposal site. Construction waste streams to be recycled by waste management contractors where available. Residual wastes to local landfill in accordance with landfill classification.
Energy efficiency		Approximately 32 to 36 GJ per tonne ammonia.
Finished product transport		Transport of liquid ammonia by pipeline to existing storage tanks and distribution header.
Emissions to air		NO_X emissions to air: Approximately 150,000 kg per annum
Noise		< 30 dB(A) cumulative at nearest noise sensitive premises. < 70 dB(A) at Proposal boundary.
Greenhouse gas emissions		
Construction		
Scope 1		Estimated 19,505 tonnes CO_2-e.
Scope 2		Any occurring will displace Scope 1 emissions described above.
Scope 3		Not determined.
Operation		
Scope 1		Estimated maximum 539,003 tonnes CO_2-e per annum.
Scope 2		Estimated 33,735 tCO_2-e per annum avoided via purchase of RECs
Scope 3		Estimated 42,961 tonnes CO_2-e per annum.
Rehabilitation		
Not applicable		
Commissioning		
Commissioning of the Proposal will be subject to operational limits above.		
Decommissioning		
Removal of all above surface infrastructure. Buried services will be decommissioned and left in-situ or removed.		
Elements which affect extent of effects on environment		
Proposal time	Expected Project life	35 years
	Project Development	Approximately 3 years
	Operation phase	Approximately 30 years
	Decommissioning	Approximately 2 years

Table ES.3: Summary of potential impacts, proposed mitigation, and outcomes

Environmental factor	EPA objective	Potential impact	Key mitigation measures	Expected outcome
Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.	Generation of liquid wastes requiring disposal to the marine environment via SDOOL with potential to reduce marine water quality.	Discharge to SDOOL in accordance with current regulatory requirements specified in the current EP Act Licence. Continued implementation of established wastewater and liquid waste management. Through either a new water treatment plant to process additional volumes of wastewater for reuse onsite or obtaining a reduction in overall site cooling water blow down to offset the additional wastewater generated by the project.	The quality of wastewater currently discharged to the marine environment from CSBP facilities is not expected to change as a result of process discharges from the Proposal; therefore, no impacts to the quality of marine waters are expected. No significant residual impacts have been identified; therefore, it is considered that the EPA's environmental objective for Marine Environmental Quality will be met.
Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	Potential to impact human health via NO_X emissions to air causing a reduction in ambient air quality.	Low NO_X burners will be implemented to ensure ambient NO_X concentrations remain within the relevant standards.	Modelling of NOx emission dispersion determined unacceptable air quality impacts are not likely. Therefore, it is expected that the EPA's environmental objective for Air Quality will be met.
Greenhouse Gas (GHG) Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	GHG emissions will add to global GHG concentrations with potential to contribute to climate change influenced by changes to global GHG emission concentrations.	Avoidance (and reduction) of GHG emissions through plant design to optimise footprint, technology, and heat recovery. Commitment to purchase of renewable energy to meet external electricity demand. Implementation of GHG Management Plan, including five yearly reduction targets. Green hydrogen plant and ongoing plant improvement initiatives. Investment in technical solutions for GHG mitigation. Commitment to offset emissions not mitigated through other channels.	Following application of the mitigation targets, no significant residual impacts have been identified; therefore, it is considered that the EPA's environmental objective for Greenhouse Gas Emissions will be met.
Social Surroundings	To protect social surroundings from significant harm.	Noise emissions have potential to impact social surroundings at receptors in nearby industrial and residential areas.	The plant design incorporates noise mitigation measures. Implementation of an acoustic barrier to ensure assigned noise levels are not exceeded at the neighbouring industrial premises.	Noise modelling indicates that the assigned noise levels will be met. Therefore, noise from the Proposal will not significantly impact social surroundings and that the EPA's environmental objective for this factor will be met.

1. Introduction

CSBP Limited (CSBP; the Proponent) is seeking approval to construct a new ammonia plant (Ammonia Plant 3, "AP3") at its existing facility in Kwinana, Western Australia. The proposed ammonia plant (the Proposal) will be a self-sustained facility with a nominal production capacity of up to approximately 300,000 tonnes per annum (tpa).

The Proposal will reduce the reliance on third-party ammonia imports. The Proposal is in the Kwinana Industrial Area (KIA) in the Perth metropolitan region of Western Australia, approximately 40 km south of the Perth Central Business District (CBD) (Figure 1.1).

Ammonia and its derivatives are not only critical inputs to the Western Australian mining and agriculture sectors but are also a future carrier of energy to support wider industry. By reducing reliance on imported ammonia through onshoring of manufacturing, CSBP is better placed to continue its reliable ammonia supply within the value chain. Further still, replacing imported ammonia with lower carbon manufactured ammonia enables critical mining, agriculture, and mineral processing industries to have access to lower carbon intensity products.

1.1 Purpose and scope

This document has been prepared to provide supporting information and evidence for referral of the Proposal to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (WA) (EP Act).

In preparing this referral, the following guidance has been considered:

- Instructions on how to prepare an Environmental Review Document (EPA 2020a); and
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2020b).

1.2 Proponent

CSBP is a major manufacturer and supplier of industrial chemicals, fertilisers and related services to the mining, mineral processing, industrial and agricultural sectors. CSBP, its subsidiaries and joint ventures, form the Chemicals and Fertilisers business units of Wesfarmers Chemicals, Energy & Fertilisers (WesCEF).

WesCEF's vision is to grow a portfolio of leading sustainable businesses. Core to this vision is its interim greenhouse gas[1] (GHG) emissions reduction target of 30% by 2030 and net zero emissions by 2050. Further, WesCEF requires all new projects to have a clear and credible path to net zero emissions by 2050.

CSBP produces ammonia at its facilities located within the Kwinana Industrial Area. The ammonia is used as a feedstock in downstream chemical and fertiliser production at the site, as well as being sold to third parties, primarily those involved in nickel processing.

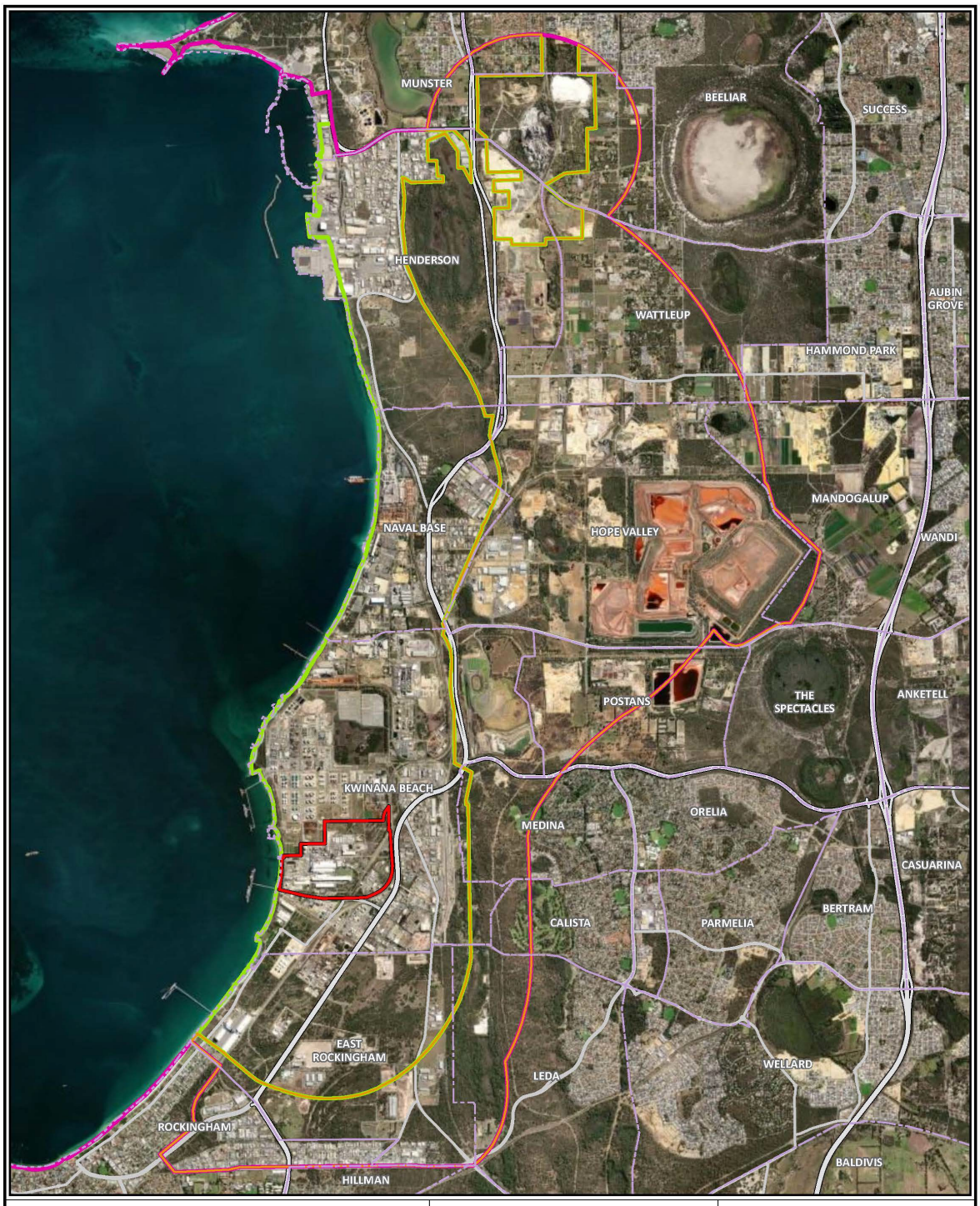
The proponent details for this referral are provided in Table 1.1.

Table 1.1: Proponent details

Proponent	CSBP Limited
ACN	008 668 371
Address	Kwinana Beach Road, Kwinana WA 6167
Contact	Daniel Thompson – Environmental Superintendent dthompson@wescef.com.au 08 6378 5821

[1] Greenhouse gases are gases in the atmosphere such as carbon dioxide, methane and nitrous oxide that can absorb infrared radiation, trapping heat in the atmosphere

Figure 1.1: Regional location



2. Proposal

2.1 Proposal content

2.1.1 Background

CSBP's major chemical and fertiliser production facilities are in Kwinana, 40 km south of Perth in Western Australia. The entire CSBP Kwinana Industrial Complex (CSBP Kwinana) encompasses an area of 138 ha, with the BP Kwinana refinery to the north and a railway corridor to the east (Figure 2.1).

CSBP handles approximately 525,000 tonnes per annum (525 ktpa) of ammonia at Kwinana, where it is used for the manufacture of ammonium nitrate, fertiliser and sodium cyanide; and is sold externally to customers.

CSBP currently operates a single train ammonia plant (Ammonia Plant 2, "AP2"), which manufactures half of the ammonia requirements, with the balance (approximately 260 ktpa) being imported from external sources via bulk shipments through Fremantle Ports – Kwinana Bulk Jetty (KBJ). The imported ammonia is unloaded at KBJ and transferred to storage tanks at CSBP Kwinana via a dedicated pipeline.

CSBP commenced manufacturing and handling ammonia at Kwinana in 1967 following the construction of its Ammonia Plant 1 (AP1), which was decommissioned in the year 2000 after commissioning AP2.

2.1.2 Proposal location

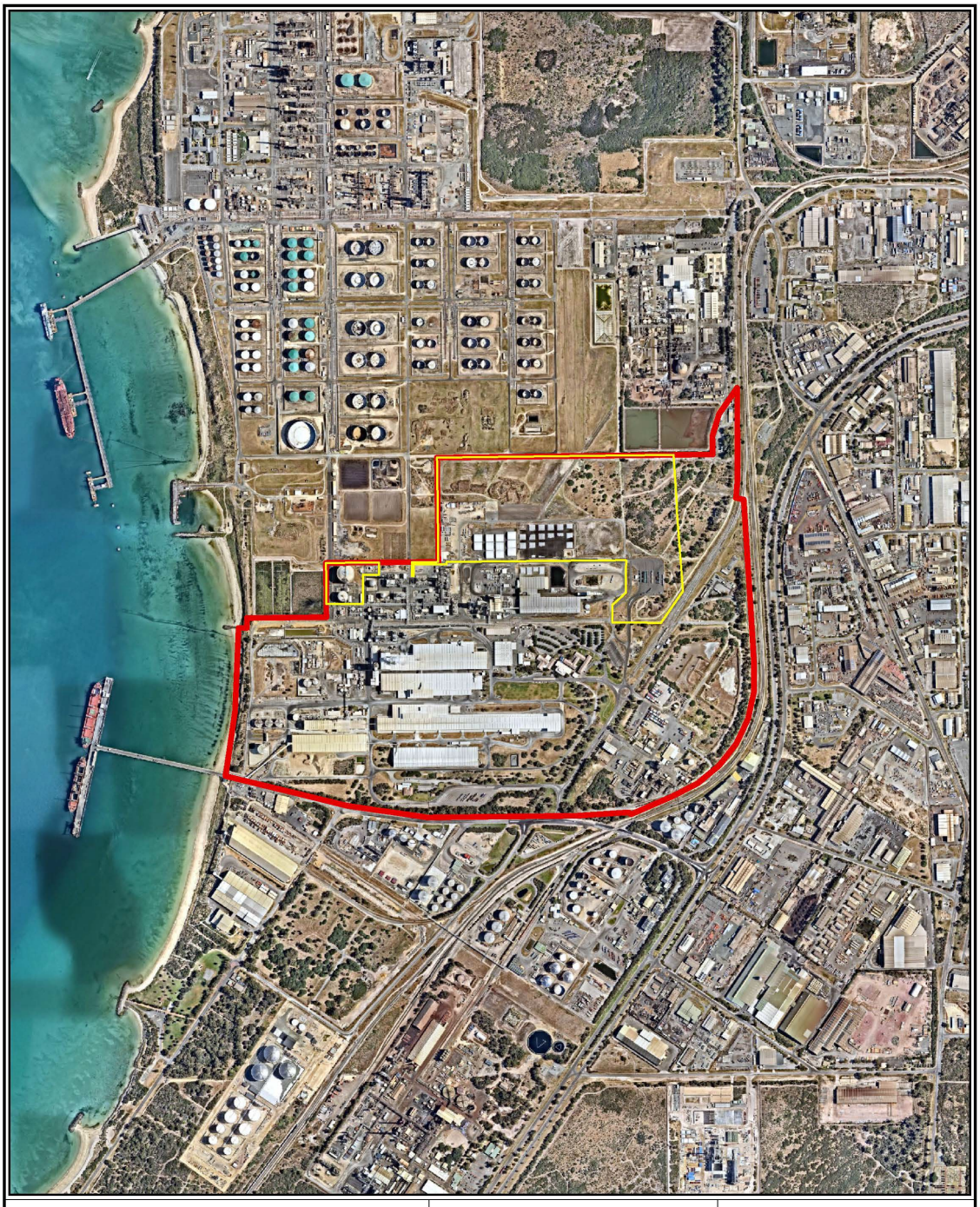
The Proposal Footprint will be located within a 27.52 ha Development Envelope within the boundary of CSBP Kwinana (Figure 2.1).

AP3 will be directly north of AP2 and west of the existing ammonium nitrate dome shelter storage, which will be relocated to the east to facilitate the Proposal. The area north of the proposed plant will be used during construction for access, laydown, and car parking (Figure 2.2).

2.1.3 Proposal schedule

Subject to approvals and final investment decision, construction works are proposed to commence in the first half of calendar year 2024, with commissioning anticipated in the second half of calendar year 2027. The schedule will be refined to accommodate regulatory requirements and timing of the final investment decision.

Figure 2.1: Proposal location



Legend
CSBP Kwinana
Development Envelope

Scale 1:15,000 at A4 (0 100 200 metres)		**Lot 20 Kwinana Beach Road Kwinana WA 6167**
Coord. Sys. GDA2020 MGA Zone 50		**PROPOSAL LOCATION**
Job No: 60751		
Client: CSBP		**FIGURE 2.1**
Version: A	Date: 22-Jul-2022	strategen JBS&G
Drawn By: ianandagoda	Checked By: JB	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\CSBP\60751 Kwinana AP3 s38 referral\GIS\Maps\R01_Rev_A\60751_02_1_PpslLocn.mxd
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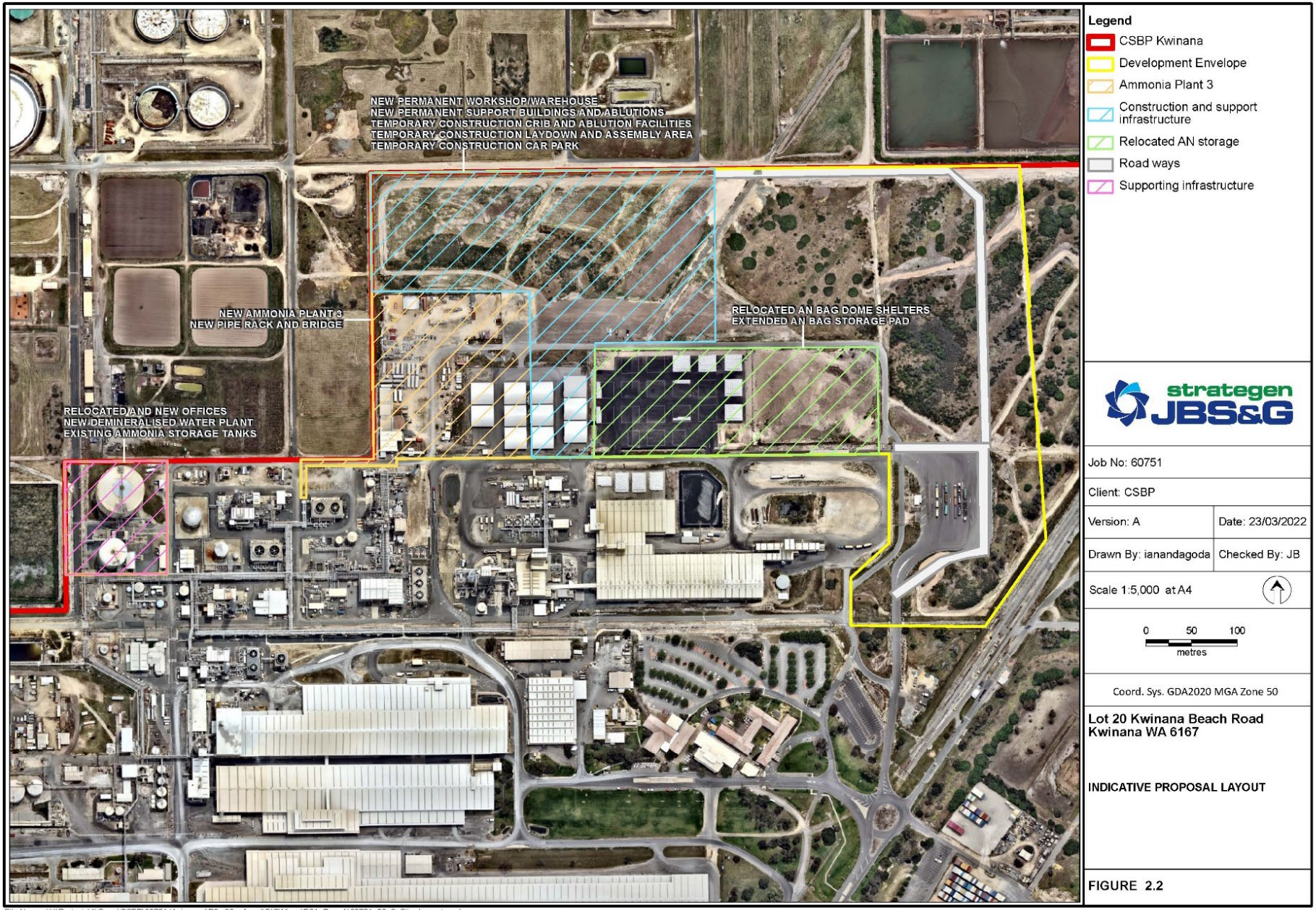

Figure 2.2: Proposal layout

2.1.4 Proposal description

The Proposal involves the construction and operation of:

- 300,000 tpa ammonia plant;
- Cooling tower;
- 10 MW electrolyser;
- Natural gas-fuelled steam boiler;
- Water purification units;
- New pipe racks, pipe bridges and tie-ins to facilitate utility, raw material, and finished product delivery;
- Internal building modifications to existing central control room; and
- Temporary construction facilities – roads, laydown area, site offices, and welfare and ablution facilities.

Additionally, the following demolition and relocation activities will take place:

- Relocation of ammonium nitrate bag storage dome shelters; and
- Demolition and relocation of existing maintenance workshop and offices.

The Proposal is designed to operate continuously 24 hours a day, seven days a week.

Ammonia manufacturing technologies have remained fundamentally unchanged since AP2 was commissioned in 2000. The key raw materials required for the manufacture of ammonia are air (oxygen and nitrogen), steam from heating water, and methane from natural gas. Nitrogen is obtained from the air, and hydrogen from steam and methane. Outputs are primarily liquid ammonia, carbon dioxide (CO_2) and water condensates.

The ammonia production process includes the following stages:

- Desulphurisation of natural gas feed (methane);
- Reforming of methane and steam to carbon monoxide and hydrogen;
- Shift conversion of carbon monoxide to CO_2;
- Removal of CO_2 by absorption by methyl diethanolamine (MDEA);
- Synthesis of ammonia from synthesis gas; and
- Purification of purge gas from the synthesis loop
- Refrigeration and storage of liquid ammonia.

The process flow diagram of AP3, including the emission and discharge points, is shown in Figure 2.3.

The Proposal will incorporate design, operability and maintainability improvements made by CSBP at the existing AP2 over the last 20 years, including the following key enhancements:

- Equipment used and instrumentation and automation employed will reflect modern technology;
- Primary reformer design improvements to reduce natural gas consumption, improve reliability and overall plant efficiency;
- Latest types of packings (which increase interfacial area between gas and MDEA solution) will be installed in the CO_2 removal system to reduce pressure drop and improve performance;

- Additional internal power generation capacity by upgrading the steam turbine and alternator from 7.5 MW to 12 MW; and
- Through design optimisation and efficiency improvements implemented during the front-end engineering design (FEED) phase, it is expected that the Proposal will have surplus process waste heat, which can be used for additional power generation.

Further to the improvements described above, the Proposal includes a small-scale (10 MW) electrolyser to produce circa 3.5% (17,150 tonnes) ammonia from renewable hydrogen. The electrolyser will use electricity to generate hydrogen and oxygen from high purity water. The hydrogen will directly displace a portion of the natural gas used in the ammonia manufacturing process. The oxygen generated from the electrolyser will be used in the secondary reformer to improve its efficiency and generate additional steam for electricity generation (circa 0.7 MW). A reduction in the electricity consumption of the syngas compressor will also be achieved due to the lower methane content in the syngas. The net effect will be a reduction in GHG emissions while gaining valuable experience to facilitate transitioning to large-scale green hydrogen and ammonia production when it becomes commercially viable.

The Proposal will be a self-sustaining ammonia plant with a dedicated steam boiler, natural gas, and water supply. The plant will be able to start up and operate independently from other existing facilities at CSBP Kwinana. However, some utilities and services for the plant will be integrated with the other facilities; this integration will provide redundancy and operational flexibility.

Infrastructure is already in place at CSBP Kwinana to handle the storage and distribution of cold and warm liquid ammonia products. Cold ammonia will be stored in existing ammonia storage tanks – Tank 1 (10,000 tonne capacity) and Tank 2 (30,000 tonne capacity) – with no increase required in the current ammonia storage capacity at CSBP Kwinana. Warm ammonia will be directed to an existing ammonia distribution header for supply to internal and external customers by pipeline.

The Proposal will require approximately 1,610 ML of water per annum for process operations, predominantly for the cooling tower. Water from various sources will be blended to achieve required standards, including those for the prevention of corrosion and scaling damage in the cooling tower. CSBP has sub-artesian groundwater available within its current licensed allocation at CSBP Kwinana. However, the preferred strategy for meeting process water demands for the Proposal is to use recycled water from the Kwinana Water Reclamation Plant (KWRP)[2].

CSBP is also investigating options for the treatment of wastewater from CSBP Kwinana for recycling within the existing and proposed production plants. Reticulated scheme water from Water Corporation is also available at CSBP Kwinana if needed to supplement other sources and will be used for workforce amenities; however, this is the least preferred alternative for operational purposes. It is anticipated that scheme water will not be used extensively for process purposes, except in emergency or supply disruption situations.

Natural gas will be piped directly to the plant from the DBNGP with no storage required at CSBP Kwinana.

The Proposal will result in the employment of up to 500 people during the construction phase. An additional workforce of approximately 15 people will be required following commissioning for ongoing operation and maintenance of the plant.

[2] Subject to satisfactory negotiations with Water Corporation to extend the CSBP off-take of KWRP water (likely to occur in 2023).

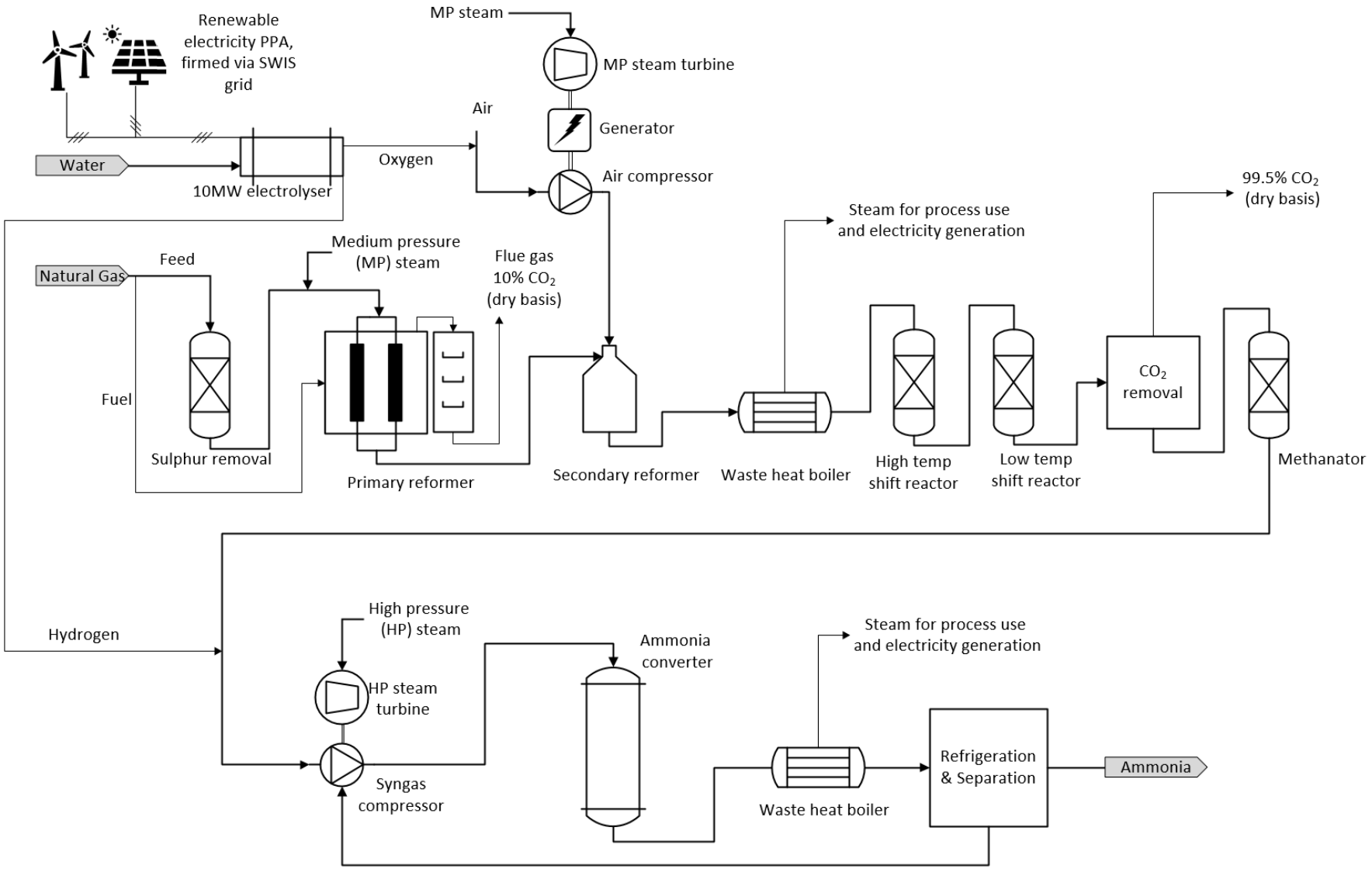

Figure 2.3: Proposal schematic

2.2 Proposal alternative

Operation of the Proposal will increase the CSBP's total ammonia production capacity to over 500 ktpa, reducing the reliance on third-party ammonia imports. Avoiding imported ammonia and the associated import costs, risks, and environmental impacts associated with freight are in alignment with CSBP's safety, growth, and sustainability strategies.

The option to "do nothing" with respect to increasing ammonia production capacity at CSBP Kwinana would mean that the potential to achieve reduction in environmental impacts will not be realised. Specifically, reductions in Scope 3 GHG emissions associated with the transport of imported ammonia will not be avoided.

CSBP undertook a project location and size optimisation study, with two plant sizes (300,000 tpa and 600,000 tpa) and two locations (CSBP Kwinana and Geraldton). The study concluded that a 300,000 tpa plant at CSBP Kwinana was preferred. The plant size decision was driven by CSBP's contracted gas positions and current ammonia requirements.

CSBP Kwinana was selected as the preferred location due to being an existing and established facility realising efficiencies related to integration with existing infrastructure, such as ammonia storage tanks and natural gas supply pipeline. The utilities and services for the Proposal will enable standalone operation but allow for integration with the overall site facilities. A plant in Geraldton would also have required the ammonia to be transported to CSBP Kwinana for local consumption. Locating the Proposal in Kwinana alleviates costs and potential environmental impacts associated with loading, freight and unloading infrastructure and activities.

The Proposal is based on a replicate design of the existing AP2, leveraging efficiencies of a plant that CSBP has experience in operating and maintaining for over 20 years. During the FEED phase for the Proposal, CSBP collaborated with the technology provider, engineering contractor and equipment vendors to further enhance and modernise the design to align with industry best practice.

Implementing a plant operating fully on renewable electricity to generate hydrogen from the electrolysis of water (green hydrogen) was considered. This option is precluded at this time because there is currently no access to large quantities of renewable energy or cost-effective green hydrogen in the vicinity of the Proposal. To produce the volume of green hydrogen necessary to make 300,000 tpa of ammonia would require:

- 1,120 MW solar farm assuming a 30% capacity factor[3]. The electricity requirement is equivalent to approximately 28% of the SWIS non-synchronous generation capacity[4]. In terms of land mass, this would require a solar farm footprint of approximately 3,490 hectares which is 25 times the size of CSBP's Kwinana facility; or
- 750 MW wind farm, assuming the electrolysers are operated on wind energy assuming a 45% capacity factor[5]. The electricity requirement is equivalent to approximately 19% of the SWIS non-synchronous generation capacity. In terms of land mass, this would require a wind farm footprint of approximately 11,290 hectares which is 82 times the size of CSBP's Kwinana facility.

The cost of constructing and operating the infrastructure required to provide renewable hydrogen for ammonia production is significantly higher than the cost of methane-based ammonia production, making the project economically unviable at this time. The Proposal will incorporate a small-scale

[3] Capacity factor equivalent to that of Merredin solar farm WA https://www.pv-magazine-australia.com/2022/01/24/western-australian-solar-farm-leads-way-in-performance-stakes/

[4] Based on 4,000 MW of SWIS non-synchronous generation which is expected to be exceeded by 2024-2025 (AEMO 2021)

[5] Capacity factor achievable by Badgingarra wind farm WA https://www.pv-magazine-australia.com/2022/01/24/western-australian-solar-farm-leads-way-in-performance-stakes/

10MW electrolyser to develop CSBP's operational capability while reducing the project's Scope 1 GHG emissions. Further substitution of natural gas with green hydrogen as feedstock will be phased in when it becomes commercially viable. The green hydrogen will be sourced by either additional investment in electrolysers and on-site hydrogen generation, or pipeline supply from third parties. Once available, green hydrogen will also be used to replace the natural gas fuel.

2.3 Local and regional context

The existing CSBP Kwinana site encompasses an area of 138 ha and is situated at the intersection of Kwinana Beach Road and Rockingham Beach Road within the Kwinana Industrial Area (KIA), which is zoned 'Industrial' under the Town of Kwinana Town Planning Scheme No. 1 and the Metropolitan Regional Scheme (Figure 2.4).

CSBP Kwinana is directly adjacent to the Cockburn Sound beachfront to the west, with industry located adjacent to the site in all other directions. Further to the east is a one kilometre wide parks and recreation reserve, which preserves a landscape buffer between the KIA and 'Urban' zoned land at Medina.

The nearest residential areas are located at Medina, approximately 2.9 km to the east; Calista 4.3 km to the southeast; Hillman 5 km to the south; and North Rockingham 3.3 km to the southwest (Figure 1.1).

Figure 2.4: Locality

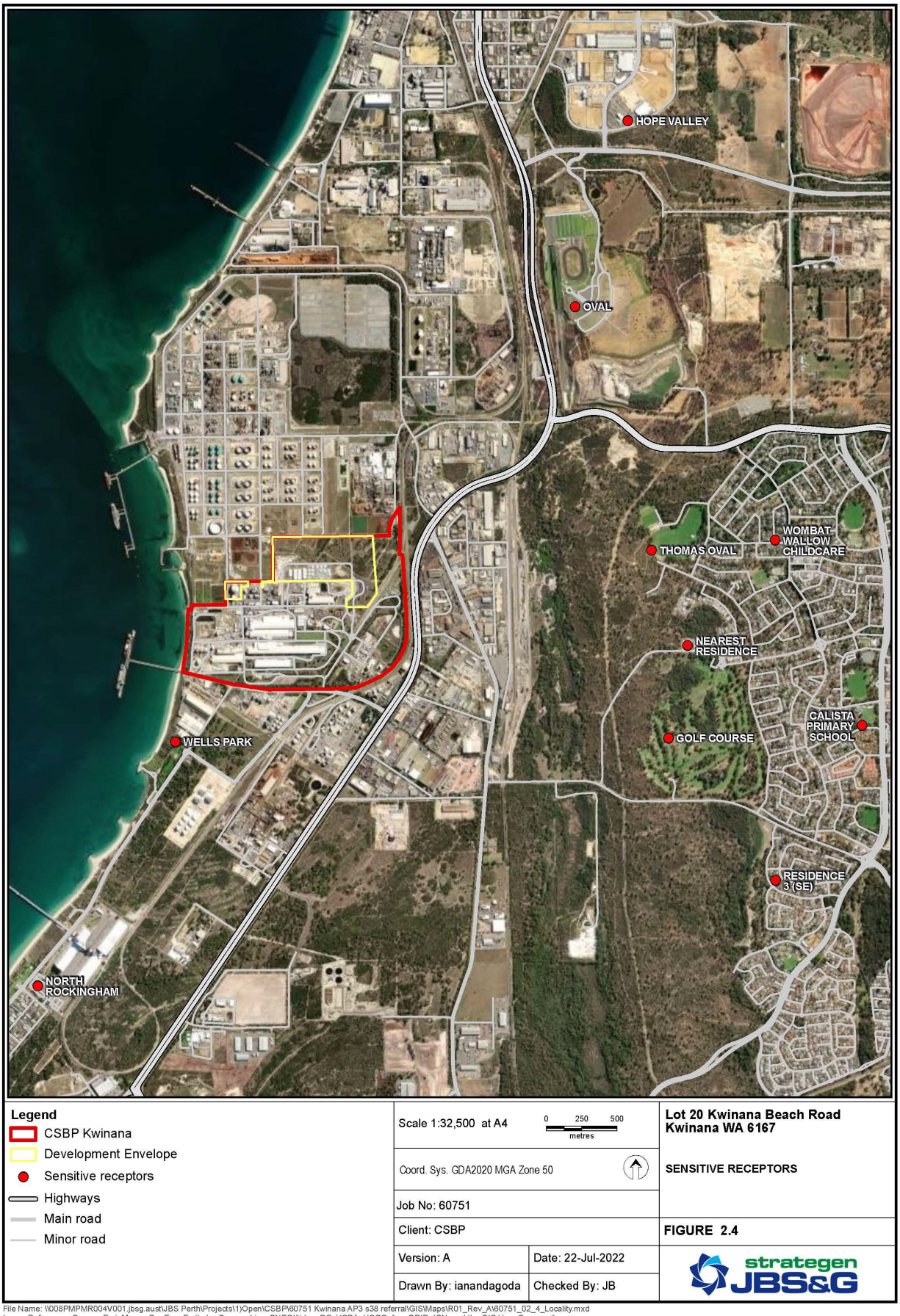

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Image Reference: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

2.3.1 Landscape

The Development Envelope has a generally flat landform with little original vegetation. The industrial development is primarily screened by vegetation from Patterson Road and from Kwinana Beach Road. CSBP Kwinana is visible from Kwinana Beach, and high-level infrastructure can be seen in the distance from residential areas.

2.3.2 Climate

The Kwinana locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BOM) monitoring station is Garden Island (ref 009256) – average climate statistics from which are presented in Figure 2.5.

Summer temperatures between December and March vary from a mean maximum of 29°C and mean minimum of 15°C. The winter months from June to August are mild, experiencing a mean maximum temperature of 18°C and mean minimum of 11.5°C. Mean annual rainfall (2001 to 2021) is 598 mm with the wettest month, on average, being July (Bureau of Meteorology, 2021).

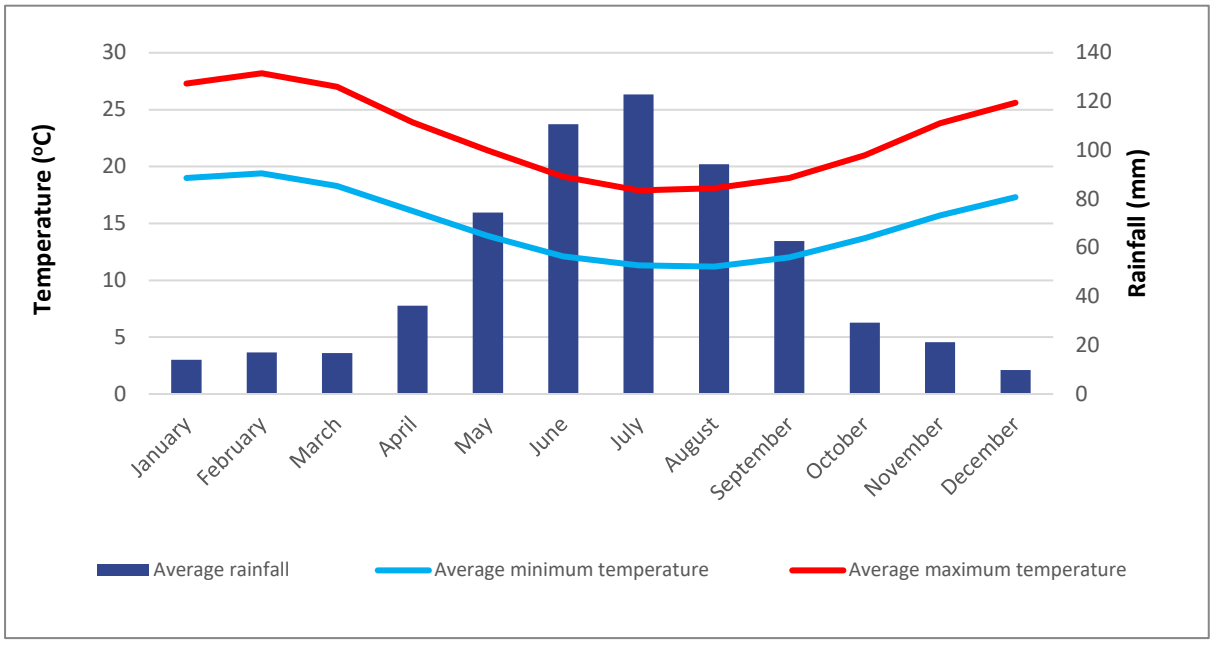

Figure 2.5: Mean monthly climatic data for Kwinana

2.3.3 Vegetation and fauna

The Development Envelope falls within Beard vegetation association 3048 described as shrublands, scrub-heath on the Swan Coastal Plain (Shepherd, 2001), and the Heddle vegetation Quindalup Complex which is a coastal dune complex consisting mainly of the strand and fore-dune alliance and the mobile and stable dune alliance.

The Development Envelope is primarily cleared and comprises existing hardstand or is largely within areas previously cleared for fire hazard protection. The Proposal will require clearing of less than 1 ha of vegetation in the Development Envelope.

The Development Envelope comprises part of a 25.78 ha area approved specifically for hazard reduction clearing (slashing of understorey) under Clearing Permit 7390/1 granted by the then Department of Environment Regulation (DER, now DWER) on 16 February 2017 (Appendix A).

During a 2017 site inspection conducted by DWER prior to granting the existing clearing permit, the vegetation condition was reported as degraded; structure severely disturbed (Department of Environmental Regulation, 2017). Exotic grasses were reported in place of native understorey species,

and trees to the western side of the area were primarily non-native. The application area was not considered by DWER to be a significant remnant in an extensively cleared area.

Acacia rostellifera (Summer-scented wattle) were reported to be in the centre and towards the northern border of the area. To the eastern boundary, beyond the access road for the Proposal, a stand of *Eucalyptus gomphocephala* (Tuart) trees over scattered *Xanthorrhoea preissii* (Balga) were recorded.

The DWER assessment determined that the largely degraded condition of the understorey was not likely to provide suitable habitat for any priority flora species found at other locations in the local area. Furthermore, the vegetation was not determined to be comparable to any priority ecological community or threatened ecological community that have been recorded within the local area.

Suitable habitat for Priority 5 Quenda/Southern brown bandicoot (*Isoodon obesulus subsp. fusciventer)* was reported by DER within the area approved for clearing. The stand of *Eucalyptus gomphocephala* (Tuart) trees located along the eastern boundary of the area approved for hazard reduction clearing under the existing permit was noted as potentially suitable foraging habitat for all three black cockatoo species i.e., Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*). This area is, however, beyond the eastern border of the Development Envelope.

2.3.4 Landforms and soils

The Development Envelope is located towards the northern end of the Becher-Rockingham beach ridge plain. It straddles the boundary between the Quindalup soil unit, which consists of beach ridges and unconsolidated calcareous sand, and the Cottesloe soil unit, which consists of shallow, yellow-brown sands and exposed limestone (Kinhill-Stearns, 1986).

2.3.5 Geology and hydrogeology

The Development Envelope is in the Coastal Belt subdivision of the Swan Coastal Plain in the Quindalup Dunes, which is a relic foredune plain of the Holocene period (Gozzard, 1983) (Davidson, 1995). The geological profile of the land is typical of the coastal deposits found in the area and consists of Safety Bay Sand (recent) unconformably overlying Tamala Limestone and the Leederville Formation (Pinjar Member).

The Safety Bay Sand, which is between 12 and 16 metres below ground level (mbgl), is unconsolidated and well compacted (Barnes & Whincup, 1981). The Tamala Limestone Formation is between 16 to 30 mbgl. Together, the Safety Bay Sand and the Tamala Limestone contain unconfined aquifers (Dames & Moore, 1990) that are considered to form a single (superficial) aquifer system at a regional level.

Groundwater in the superficial aquifer originates from rainfall recharge, with groundwater flow in a predominantly westerly direction. Groundwater discharge occurs via evaporation and transpiration, surface discharge to interdunal wetlands, abstraction via bores, and outflow to the ocean.

Discharge to the ocean is controlled by the geometry of the aquifer and its intersection with the surface, sea, and bed. The Tamala Limestone has high transmissivity, exceeding 4,000 m^2/day, resulting in low hydraulic gradients in the vicinity of the Development Envelope. The overlying Safety Bay Sand has a transmissivity of 100 to 200 m^2/day (CSBP, 2021).

A clayey silt aquitard occurs at the base of the Safety Bay Sand across the area. The thickness ranges from 0.1 to 3.0 m, with an average thickness of 1.3 m. This layer forms a semi-confining aquitard, limiting vertical hydraulic connectivity between the Safety Bay Sand and Tamala Limestone aquifers. The vertical leakage is still sufficient to prevent significant head differences (greater than one metre) between the two aquifers.

The superficial aquifer is underlain by two major confined aquifers:

- The Leederville Formation; and
- The deeper Yarragadee Formation.

The Leederville Formation aquifer consists of interbedded sandstone, siltstone, and shale units. The sand beds are frequently silty, and groundwater quality is generally brackish, although local areas of fresh water do occur. Groundwater enters the Leederville Formation from downward leakage through the superficial formations and moves westward to discharge to the ocean (Sinclair Knight Merz, 2002).

The Yarragadee Formation is separated from the Leederville Formation aquifer by the South Perth Shale, a confining layer, and is a multi-layered aquifer consisting of interbedded sandstone, siltstone, and shale. The aquifer contains a significant resource of brackish water (Sinclair Knight Merz, 2002).

2.3.6 Groundwater

CSBP holds water abstraction licences under the *Rights in Water and Irrigation Act 1914* (RIWI Act), which permit abstraction of up to 4,600 ML/annum from bores in the Tamala (superficial) and Yarragadee (sub-artesian) aquifers. Annual groundwater abstraction has gradually increased as production has increased, but the total volume abstracted has remained within licence limits.

CSBP also supplies a significant volume of abstracted sub-artesian water to neighbouring industries to reduce their reliance on scheme water.

CSBP has implemented a Groundwater Operating Strategy for groundwater extraction and use (CSBP, 2019). Included in the documented strategy is the quantity of water (per day) that can be extracted from each licenced bore and the water level and water quality monitoring that is carried out at the site.

The site was classified as 'Potentially Contaminated – Investigation Required' on 12 September 2008 under the *Contaminated Sites Act 2003* (CS Act). This classification was due to the presence of nitrogen, arsenic and hydrocarbons in both soil and groundwater. A Stage 2 Detailed Site Investigation (DSI) was completed (Cardno, 2016) and endorsed in 2018 by a DWER accredited Contaminated Sites Auditor appointed under the CS Act. A Stage 3 DSI was subsequently completed in 2020, which is currently under review by an accredited Contaminated Sites Auditor.

Investigations have shown that groundwater contamination below CSBP Kwinana includes:

- Phenol, sulfate, and chloride in the northeast portion of the area associated with the Chemical Industries Kwinana (CIK) Phenolic Plume;
- Sulfate contamination associated with the chemical complex in the south-eastern portion of the area and former gypsum storage ponds;
- Ammonium sulfate (AMSUL) contamination in the southern part of the site from both on and off-site sources;
- Arsenic and nutrients in the north-western section of the site associated with historic activities; and
- Nutrient and sulfate impacts in the western sections of the site associated with seepage of wastewater into the Safety Bay Sand aquifer.

Groundwater monitoring found that average water levels across the site in 2020 were marginally lower than those measured in 2019 (CSBP, 2021). Seasonal changes in water level due to rainfall recharge were also observed.

2.3.7 Surface hydrology and wetlands

There are no natural surface water courses or wetlands in the Development Envelope. Stormwater is collected, and the runoff is directed to the CSBP Kwinana liquid effluent system. Effluent is

subsequently disposed of via the Sepia Depression Ocean Outlet Landline (SDOOL), which discharges beyond Port Peron, 6 km to the south.

CSBP has an artificial nutrient-stripping wetland that aims to reduce the amount of nutrients in effluent before disposal. The wetland is an area of approximately 4 ha lined with heavy-duty high-density Polyethylene (HDPE) plastic. More information on the nutrient-stripping wetland is provided in Section 6.2.

2.3.8 Marine environment

The western boundary of CSBP Kwinana is located adjacent to Cockburn Sound and approximately 6 km from Point Peron, where the SDOOL (used for discharge of treated wastewater) discharges 4 km offshore.

Cockburn Sound is 16 km long and 9 km wide, with a 17 m to 22 m deep central basin (Cockburn Sound Management Council, 2018). Garden Island extends along almost the entire western side of the sound, providing shelter from ocean swells. Shallow waters are located at the southern and northern entrances to the sound.

The area contains seagrasses which are primary producers providing habitat for many organisms supporting numerous food chains. The depth of Cockburn Sound and its degree of shelter from ocean swell make it the most intensively used marine embayment in Western Australia. Consequently, Cockburn Sound experiences influences from fishing, recreation, waste disposal, industry shipping and naval activities.

The Sepia Depression into which the SDOOL discharges is a 5 km wide and 20 m deep trough beyond the Garden Island reef chain. The seabed within the depression is mainly fine to course unvegetated sand with low benthic habitat biomass and species diversity influenced by relatively high wave energy (BMT, 2014).

2.3.9 Heritage

A search of the Aboriginal Heritage Inquiry System and the inherit database did not identify any registered heritage sites within the Development Envelope.

3. Legislative context

3.1 Environmental impact assessment process

The key legislation applicable to the environmental impact assessment and approval of the significant proposals is Part IV of the EP Act. The EPA Services Directorate (EPASD) of the Department of Water and Environmental Regulation (DWER) is responsible for the assessment of proposals under Part IV.

The Proposal is being referred to the EPA by CSBP under s38 of the EP Act. This document has been prepared to provide supporting information to the EPA on the key characteristics of the Proposal, associated activities, the receiving environment, stakeholder consultation, and potential environmental impacts and associated management measures.

Based on the assessment undertaken in this referral and the predicted outcomes with respect to the key environmental factors, CSBP is of the view that, if the EPA determines that formal environmental impact assessment is required under the EP Act, the level of assessment should be Assessment of Referral Information (ARI).

Alternatively, if the EPA determines not to assess the Proposal, CSBP considers that the associated potential environmental impacts can be adequately assessed and managed via other existing decision-making processes.

3.2 Other approvals

Other decision-making processes relevant to the Proposal are outlined in Table 3.1. In summary, the identified processes can mitigate the potential impacts of the Proposal on the environment in a manner that is consistent with the EPA's environmental objectives.

Table 3.1: Other approvals

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
Air Quality, Human Health. Social Surroundings, Discharge of Wastewater (Marine Environmental Quality)								
Chief Executive Officer (CEO) of DWER	EP Act (Part V)	Prescribed premises works approval	The works approval application process administered by DWER can mitigate the following potential impacts of the Proposal on the environment: • Emissions to air causing health and amenity impacts to nearby human sensitive receptors (EPA factors Air Quality and Human Health) • Emissions of noise causing nearby human sensitive receptors (EPA factor Social Surroundings) • Discharges of wastewater to the environment (EPA factor Marine Environmental Quality).	The Proposal will be a prescribed premises regulated by DWER under Part V of the EP Act. The Proposal will be regulated as a Category 31 chemical manufacturing premises, which includes all activities relevant to the Proposal. The prescribed premises boundary will be consistent with the Proposal Footprint described in this referral, and all activities relevant to the Proposal contained in the same boundary. Section 52 of the EP Act specifies that the occupier of a premises who carries out any work on or in relation to the premises, which causes the premises to become, or to become capable of being, a prescribed premises, commits an offence unless the occupier does so in accordance with a works approval. Therefore, CSBP will apply to DWER for a works approval before constructing the Proposal. The works approval application will be supported by detailed information regarding the proposed, including:	DWER regulates to ensure that there is not an unacceptable risk of harm to public health or the environment, consistent with the objectives of the EPA factors. The DWER assessment and decision-making processes are governed by relevant legislation and DWER policies, guidelines and procedures. Consistent with the environmental impact assessment (EIA) process under Part IV of the EP Act, DWER's regulatory functions under Part V of the EP Act are guided by the statutory object and principles of the EP Act and the following principles of good regulatory practice: • Risk-based regulation • Evidence-based decision-making • Application of Environmental Standards • Appropriate conditions	Section 62 of the EP Act allows the CEO of DWER to apply conditions to works approvals and licences that are considered to be necessary or convenient for the prevention, control, abatement or mitigation of pollution or environmental harm. DWER will set conditions to give effect to determined regulatory controls in accordance with its Guideline: Setting conditions. It is expected that the works approval will specify the infrastructure (works) that CSBP can construct and will regulate emissions and discharges associated with construction and commissioning, including dust, noise, emissions to air and discharges of wastewater and potentially	The EPA's objectives for the environmental factors Air Quality, Human Health and Social Surroundings are likely to be met through this decision-making process.	The works approval application process administered by DWER can mitigate the potential impacts of the Proposal.

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
				• Infrastructure, equipment, and activities (construction, environmental commissioning and operation); • Emissions, discharges and waste; and • Siting and location. This information will include specific plans and assessments, including but not limited to, air quality and noise assessments and commissioning plan. The EP Act requires applications for works approvals which meet DWER's requirements and are accepted, to be advertised for public comment. DWER advertises applications including publication of supporting documentation on its website for a period of 21 days. DWER can also seek comments from any public authority or person who to considers has a direct interest in the subject matter of the application, which in this case could include the Department of Health regarding potential impacts to Human Health. Post decision, appeals can be lodged against works approvals	• Fair and equitable decision-making processes • Engagement, consultation and transparency. DWER uses the following risk assessment process, which has been mapped to the relevant elements of the EIA process to demonstrate consistency: • Establish the context of the risk (receiving environment). • Identify emissions (proposal content). • Identify risk events through source-pathway-receptor analysis (potential environmental impacts) and applicant controls (mitigation). • Apply a risk rating using consequence and likelihood criteria (assessment and significance of residual impact). • Determine the risk rating (assessment and significance of residual impact).	contaminated stormwater. The works approval can also include conditions to regulate time-limited-operation of the premises whilst DWER assess the application for a licence. The works approval may include conditions relating to compliance and commissioning reporting, atmospheric discharge points, air emission monitoring requirements, stack emission limits, emissions abatement equipment, water pollution (discharge) controls and secondary containment of environmentally hazardous liquids. DWER undertakes proactive compliance of activities regulated under the EP Act to ensure they do not pose unacceptable risks to water, the environment and public health. Compliance		

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
				within 21 days of the applicant being notified of the decision.	• Determine the regulatory controls (EPA report). The assessment criteria used to determine the risk rating (consequence) will be the same as those identified for the EIA of the Proposal, including air quality guideline values, health standards, noise regulations, and water quality standards. In most cases, the technical experts providing advice for the assessment will be the same for DWER as for the EPA (through DWER's EPASD).	inspections of prescribed premises also focus on determining whether emissions and discharges are managed appropriately by the current instrument and assessing compliance with the instrument and relevant associated legislation.		
Chief Executive Officer (CEO) of DWER	EP Act (Part V)	Prescribed premises licence	The licence application will consider the same potential impacts as the works approval.	Section 57(2) of the EP Act requires works completed under a works approval to be completed to the DWER's satisfaction in accordance with the relevant conditions of the works approval, before a licence application for the premises may be assessed by the department. However, DWER recognises that proponents will want to start operations as soon as construction of works is complete, during the time taken to assess the licence application. To facilitate this,	The licence application will be assessed in accordance with the same regulatory framework described for the works approval.	It is expected that the licence will include conditions relating to the specification and operation of infrastructure and equipment, authorised emission points and parameters, emissions limits, emissions monitoring and reporting. In addition to proactive compliance of activities carried out by DWER, licences typically include conditions for	The EPA's objectives for the environmental factors Air Quality, Human Health and Social Surroundings are likely to be met through this decision-making process.	The works approval application process administered by DWER can mitigate the potential impacts of the Proposal.

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
				the department uses a risk-based approach to determine whether a premises can undertake environmental commissioning and operate under a works approval, while the department assesses the licence application. The phases of the project that are expected to occur during the transition from the works approval to the licence include: • Construction phase; • Commissioning phase; and • Time-limited operations phase. The licence application will be based on the information provided for the works approval and will also include an Environmental Compliance Report confirming that what has been installed is authorised by the works approval, and an Environmental Commissioning Report confirming that the premises can operate to the specification detailed in the works approval that emissions and discharges from the premises meet the required specifications. As for the works approval application, licence applications as advertised for public comment and granted		annual licence-holder audit of compliance. These Annual Audit Compliance Reports (AACRs) are submitted to DWER and published on the department's website.		

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
				licences are available for appeal.				
Social Surroundings								
Metro Outer Joint Development Assessment Panel (JDAP)	Planning and Development Act 2005	Development Approval	Development applications are required to ensure a proposal is consistent with the zoning for the area and complies with the Local Planning Scheme and related Local Planning Policy requirements. The development application process and assessment of the Proposal against the relevant local planning schemes and policies can mitigate potential impacts to Social Surroundings, including nuisance aspects associated with air quality and noise.	The Proposal will be assessed as a mandatory development application to be determined by the JDAP as it exceeds the project value threshold of $10 million or more. Operating under the Planning and Development (Development Assessment Panels) Regulations 2011, the JDAP determines development applications as if it were the responsible planning authority, against the relevant local or region planning scheme and policies. However, the City of Kwinana will assess the application and prepare a report containing recommendations for the JDAP to consider. Development applications are advertised for public submissions and organisations and individuals can apply to present at JDAP meetings. There are no third party appeal rights and only the applicant can request the State Administrative Tribunal (SAT) review a JDAP decision.	The development application will be assessed against the Metropolitan Region Scheme and the City of Kwinana's Local Planning Scheme 2 and Structure Plans.	Most development approvals have conditions that form part of the development approval package and set out the circumstances in which the approved development may proceed. Often the purpose of conditions is to protect or reduce impacts on the environment and amenity. The City of Kwinana standard conditions include those, amongst others, for the mitigation of emissions of wastewater, waste, noise, dust and odour.	The EPA's objective for the factor Social Surroundings is likely to be met through this decision-making process.	The development approval application process carried out by the City of Kwinana and JDAP can mitigate the potential impacts of the Proposal.

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
Flora and Vegetation, Terrestrial Fauna								
Chief Executive Officer (CEO) of DWER	EP Act (Part V)	Clearing permit	Should the Proposal not be assessed by the EPA, the potential impacts to Flora and Vegetation and Terrestrial Fauna can be mitigated through the decision-making process associated with clearing permits.	CSBP held a clearing permit applicable to the Development Envelope (ref: 7390/1; Appendix A). The permit expired in March 2022; however, CSBP can apply for a new permit should the Proposal not be assessed by the EPA and no appropriate exemptions be available. Under the EP Act, statutory requirements apply to clearing permit applications, including advertising, and seeking public submissions. The decisions on applications are also subject to appeal.	Clearing permit applications are assessed according to environmental risk. The risk-based assessment approach is based on the size and location of the area to be cleared, sensitivity of the environment and the environmental values that occur within or adjacent to the area under application, the purpose of the clearing and public interest. DWER, in deciding about a clearing permit has regard to the clearing principles contained in Schedule 5 of the EP Act. The clearing principles are consistent with the EPA objectives for the factors Flora and Vegetation and Terrestrial Fauna.	Clearing permits may be subject to conditions. The types of conditions that are placed on a clearing permit depend on the outcome of the environmental impact assessment. Conditions are used to prevent, control, abate or mitigate environmental harm or to offset the loss of the cleared vegetation. Conditions may relate to record keeping, reporting, revegetating or other actions.	The EPA's objectives for the environmental factors Flora and Vegetation and Terrestrial Fauna are likely to be met through this decision-making process.	The clearing permit application process administered by DWER can mitigate the potential impacts of the Proposal.
Marine Environmental Quality								
Minister for Environment	EP Act (Part IV)	No new approval required. Existing Ministerial Statement No. 665 (MS 665) held by Water	Wastewater from CSBP Kwinana is ultimately discharged to the marine environment through the Sepia Depression Ocean Outlet Landline (SDOOL) or Cockburn Sound	An EIA was completed for the proposal -use of the Cape Peron outlet pipeline to dispose of industrial wastewater, Kwinana. The pipeline and the Low Ecological Protection Area associated with the discharge	The proposal was assessed in accordance with the factors of Marine Environment Quality (ecological and social values). The proposal was assessed at the level of Public Environment Review with	MS 665 includes key characteristics, implementation conditions and proponent conditions including those for monitoring and management of the outlet, ecological	The EPA's report on the assessment concluded that it was unlikely that the EPA's objectives would be compromised,	The existing Ministerial approval can mitigate the potential impacts of the Proposal.

Decision-making authority	Legislation or agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment?					
			Ability	Process	Relevant considerations	Conditions	Likely outcomes	Overall conclusion
		Corporation applies.	submarine pipeline from CSBP.	are defined by the assessment and approval.	a 12-week public submission period. The EPA report on assessment was available for public appeal.	protection zones and toxicant criteria, toxicant and nutrient loads, and sediment quality.	provided there was satisfactory implementation by CSBP of their commitments and the recommended conditions.	
Human Health								
Chief Dangerous Goods Officer of Department of Mines, Industry Regulation and Safety (DMIRS)	Dangerous Good Safety (Major Hazard Facilities) Regulations 2007 and Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007	Dangerous Goods Licence and major hazard facility (MHF) Safety Report	The Facility will be designated as a MHF if: • it stores, handles, transports, and processes quantities of specified dangerous goods that exceed specified threshold quantities • a major incident could occur at that place; and • the Chief Dangerous Goods Officer has determined it to be an MHF.	A Safety Report, including revisions, prepared under the Dangerous Goods legislation must be submitted to the Chief Dangerous Goods Officer for approval. There is no public participation in the preparation and approval of Dangerous Goods licences and Safety Reports. MHF operators must comply with legislative obligations to provide the local community with information about their facility and the actions to take in the event of a major incident.	The Dangerous Goods legislation is limited to specific substances and regulates the storage, handling, and transport of them with a focus on minimising risk to minimising risk to people (Human Health), property and the environment.	Dangerous Goods licences contain requirements as to the types and quantities of substances that can be stored and how they must be stored. Safety Reports follow a prescribed standard and template and include risk assessment and safety management systems.	The EPA's objective for the environmental factor Human Health is likely to be met through this decision-making process.	The Dangerous Goods legislation and requirements can mitigate the potential impacts of the Proposal.

4. Stakeholder engagement

CSBP has an ongoing commitment to keeping its stakeholders and the community informed of its activities at its sites through the following actions:

- Site tours for a range of stakeholders;
- Maintenance of a relevant and current website;
- Provision of information via the Kwinana Industries Council's (KIC) Community Information Service;
- Distribution of media statements as appropriate; and
- Participation in the Kwinana Community and Industries Forum.

CSBP is currently undertaking a consultation program with key stakeholders in relation to the Proposal. The key objectives of the consultation program are to:

- Identify relevant stakeholders;
- Initiate and maintain communication;
- Develop tools for ongoing communication;
- Provide for two-way communication on management/mitigation strategies to minimise impacts of the Proposal on the environment and potentially affected stakeholders; and
- Record consultation activity, key issues, and outcomes.

4.1 Stakeholder identification and ongoing consultation

The following key stakeholder groups have been identified to date regarding the Proposal (Table 4.1). Extensive stakeholder engagement has been undertaken during the early stages of the Proposal and will continue throughout the remaining stages, including construction and operational phases.

Table 4.1: Proposal stakeholders

Stakeholder	Key interests
State Government	
Environmental Protection Authority (EPA) (including Department of Water and Environmental Regulation (DWER) – EPA Services)	Administration of the Environmental Protection Act 1986 (WA) – Part IV Environmental Impact Assessment, including environmental assessments for significant proposals.
Department of Water and Environmental Regulation (DWER)	Administration of the Environmental Protection Act 1986 (WA) – Part V Environmental Regulation, including environmental assessments and the granting of works approvals and licences for prescribed premises.
Department of Mines, Industry Regulation and Safety (DMIRS)	Administration of Dangerous Goods legislation (licensing and Major Hazards Facilities (MHFs).
Department of Fire and Emergency Services (DFES)	Emergency services, fire management and fire prevention.
Local Government	
City of Kwinana	Application of local planning schemes and policies and granting of planning/development approval for new development.
Community	
Neighbouring industry – BP Refinery	Potential environmental impacts (including cumulative) and risks.
Kwinana Industries Council (KIC) – Community Industry Forum	Potential environmental and socio-economic impacts (including cumulative), risks and benefits.

CSBP will continue stakeholder consultation during the planning and implementation of the Proposal to ensure awareness, understanding of concerns, and ongoing positive and two-way effective communication is maintained.

4.2 Stakeholder consultation

A summary of stakeholder consultation conducted to date is summarised in Table 4.2.

Table 4.2: Stakeholder consultation

Stakeholder	Date	Issues/topics raised	Proponent response/outcome
Meeting with DWER (EPA Services and Industry Regulation)	10 November 2020	Meeting was to provide an overview of the project and discuss key environmental factors – pre-referral meeting.	• Greenhouse gas determined as a key factor for the proposal. CSBP will develop greenhouse gas management plan (GHGMP) consistent with EPA Factor Guideline. Recent GHGMP such as Waitsia Stage 2 can be used as a guide • Project will likely be Assessed on Referral Information (ARI).
	16 July 2021	• Progress update • CSBP's approach to developing GHGMP • DWER/EPA expectations.	• DWER offered to review draft GHGMP prior to referral submission • CSBP will review recently approved GHGMPs to understand EPA requirements.
Meeting with City of Kwinana (CoK)	17 March 2021	Met with representatives of Planning and Development, Building Services, and Environment and Health Services to introduce project details and discuss the development approval process.	• Application will be assessed by Joint Development Assessment Panel (JDAP) • CSBP will engage a consultant to assist with development application process.
	3 June 2021	Pre-lodgement meeting with Planning and Development to discuss the development approval process.	• Application process will include clear plan(s) of buildings / infrastructure being proposed for removal/relocation, effluent disposal, and application for cooling tower • CSBP will include impact on traffic movement and noise in the application • Some or all of the proposal may be exempt from a building permit.
Meeting with Water Corporation	6 September 2021	• Additional KWRP supply/ potential increase to SDOOL discharge volume • New pipeline requirements for additional supply to CSBP Kwinana.	• CSBP to re-engage with Water Corp after KWRP expansion FEED study has been completed • Water Corp needs an offtake commitment from CSBP before it will approve expansion project.
	7 February 2022	Potential increase to SDOOL discharge volume, concentrations expected to be similar to current discharge.	Water Corp MS655 to be able to accept additional discharge volumes, with similar water quality to current discharges.
Meeting with DMIRS	April 2021	Provided project overview.	CSBP will engage with DMIRS once plant design is finalised.
Meeting with neighbouring industry - BP Refinery	7 October 2021	Share site layout changes, discuss risk contours, and noise impact.	• Risk contours will extend further into BP's boundary in an area where future projects are planned e.g., tank farm expansion • BP will provide occupancy data to allow CSBP to update the quantitative risk assessment. • BP process safety will confirm with the commercial team on plans for future expansion options. These will be discussed with CSBP to assess impact.
Community stakeholders through Kwinana Industries Council (KIC) Community Industry Forum	12 October 2021	Present an overview of the project and progress update. Discussed general concern on increased road traffic due to a number of upcoming projects.	• CSBP's project will only contribute to additional traffic during the construction period. No change during operations phase due to displacing imported ammonia with manufactured. • KIC will invite Main Roads to discuss future plans on road improvements / traffic decongestion at an upcoming Community Forum.

5. Object and principles of the Environmental Protection Act

CSBP has considered the environmental protection principles of environmental impact assessment (EIA) listed in Section 4A of the EP Act in accordance with the EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b). How each principle of the EP Act has been considered in relation to the Proposal is shown in Table 5.1.

Table 5.1: Environmental protection principles

Principle	Consideration
1. The Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: • careful evaluation to avoid, where practicable, serious, or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of various options.	CSBP has used existing environmental data for the local area and the region and has supplemented this with additional site-specific scientific studies to ensure potential environmental impacts of the Proposal are understood. This approach has enabled appropriate management measures to be adopted to minimise significant impacts, thereby mitigating the risk of harm to the environment. The Proposal will be designed and operated using established technology and techniques as used at the existing AP2. Therefore, there is a high degree of scientific certainty of the projected impacts. Accordingly, the Proposal is considered to meet the objectives of the 'Precautionary Principle'.
2. **The Principle of Intergenerational Equity** The present generation should ensure that the health, diversity, and productivity of the environment is maintained and enhanced for the benefit of future generations.	The Proposal has been designed to avoid and minimise the potential risk of significant residual effects to the health, diversity, or productivity of the environment. The Proposal incorporates mitigation measures to avoid and/or minimise the environmental effects. These management actions seek to maintain and, where possible, restore the health, diversity, and productivity of the environment for the benefit of future generations. It is acknowledged that the Proposal will contribute to global GHG emissions, and CSBP recognises that it has an important role to play in addressing climate change. Accordingly, CSBP's Climate Change Policy and Net Zero roadmap outlines its strategy to ensure that the health, diversity, and productivity of the environment is maintained and enhanced for the benefit of future generations. As stated in the policy, CSBP will manage its activities in an environmentally responsible manner that strives to achieve a target of net-zero GHG emissions by 2050 (Scope 1 and 2). The Proposal will also deliver economic, social, and environmental benefits over the long term. Accordingly, the Proposal is considered to meet the objectives of the 'Principle of Intergenerational Equity'.
3. **The Principle of the Conservation of Biological Diversity and Ecological Integrity** Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The Development Envelope is in a previously cleared area or area authorised to be cleared within the established footprint of CSBP Kwinana, enabling clearing of native vegetation to be avoided and/or minimised. Where permission for clearing is sought, DWER has previously determined the range and condition of the environmental values in the Development Envelope. Consequently, the Proposal is not anticipated to reduce the extent of any biological or ecological values with the area to a significant degree. Discharge of wastewater to the marine environment will be controlled and monitored in accordance with an established management framework to ensure that the current environmental values are maintained.

Principle	Consideration
4. Principles Relating to Improved Valuation, Pricing and Incentive Mechanisms Environmental factors should be included in the valuation of assets and services. The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance, and abatement. The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.	The economic costs associated with the Proposal will be borne exclusively by CSBP, including the costs related to environmental management of the Proposal by environmental personnel through the implementation of the relevant environmental plans. Funding for these economic costs will be obtained through the commercial sale of the ammonia and subsequent products generated from the operation of the Proposal. Integration of the Proposal within an existing industrial complex enables environmental impacts associated with developing new industrial sites to be avoided and/or minimised. Furthermore, integration with existing infrastructure such as ammonia storage tanks allows the ammonia produced by the Proposal to be distributed to internal and external customers in a cost-effective and efficient manner avoiding and/or minimising the environmental impacts associated with this aspect. Accordingly, the Proposal is considered to meet the objectives of the 'Principles Relating to Improved Valuation, Pricing, and Incentive Mechanisms'.
5. **The Principle of Waste Minimisation** All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Waste will be minimised through the life of the Proposal by adopting the hierarchy of waste controls – avoid, reuse, recycle, recover energy and safe disposal. The Proposal is located in an area with sufficient internal and external waste management infrastructure to allow the above waste management hierarchy to be implemented. Accordingly, the Proposal is considered to meet the objectives of the 'Principle of Waste Minimisation'.
Description of how the object of the EP Act has been considered	
The object of the EP Act is to protect the environment of the State. The Proposal has been designed and will be implemented in accordance with the principles of the EP Act and CSBP's own principles of sustainable development to ensure that the environment will be protected. CSBP will continue to adhere to the requirements of the EP Act and associated regulations regarding environmental protection, with consideration to relevant environmental protection policies (i.e., Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999), environmental impact assessment processes (this referral and existing ministerial statements), and environmental regulation obligations (prescribed premises works approval and licence).	

6. Environmental factors and objectives

6.1 Identification of environmental factors

This section identifies the environmental factors relevant to the Proposal, outlines the overall assessment methodology presented in this document, and describes the environmental impact assessment undertaken for each preliminary key environmental factor.

Environmental factors are those parts of the environment that may be impacted by an aspect of a proposal. CSBP's consideration of the relevance of each of the EPA's environmental factors to the Proposal is shown in Table 6.1.

Table 6.1: Environmental factors

Theme	Factor	Objective	Consideration
Sea	Benthic Communities and Habitats	*To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.*	Relevant - could be indirectly impacted through changes to marine environmental quality because of discharge of wastewater to the marine environment (assessed under marine environmental quality in Section 6.2).
	Coastal Processes	*To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.*	Not relevant - the Proposal does not result in any modification of the coastline or near-shore area.
	Marine Environmental Quality	*To maintain the quality of water, sediment and biota so that environmental values are protected.*	Relevant – there is potential for marine environmental quality to be impacted by wastewater discharges from the Proposal (assessed as a key environmental factor in Section 6.2).
	Marine Fauna	*To protect marine fauna so that biological diversity and ecological integrity are maintained.*	Relevant - could be indirectly impacted through changes to marine environmental quality as a result of discharge of wastewater to the marine environment (assessed under marine environmental quality in Section 6.2).
Land	Flora and Vegetation	*To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*	Relevant – The Proposal involves clearing of less than 1 ha of previously recorded as degraded condition (assessed as 'other' environmental factor in Section 7).
	Landforms	*To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.*	Not relevant - the Proposal will occur within the existing footprint of CSBP Kwinana and will not require significant disturbance of the ground surface (installation of plant footings and foundations only), and no large-scale excavation of in-situ materials will be required.
	Subterranean Fauna	*To protect subterranean fauna so that biological diversity and ecological integrity are maintained.*	Not relevant - there is no subsurface invasive work, and groundwater abstraction will be limited to sustainable groundwater supplies under licence.
	Terrestrial Environmental Quality	*To maintain the quality of land and soils so that environmental values are protected.*	Not relevant - the Proposal is located within the existing footprint of CSBP Kwinana; no impacts to terrestrial environmental quality are anticipated beyond those already occurring from the presence of existing and historic operations.
	Terrestrial Fauna	*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*	Relevant - the Proposal is located within the existing footprint of CSBP Kwinana; impacts to terrestrial fauna are expected to be similar to impacts of existing operations and limited to a small area (less than 1 ha) of vegetation to be cleared and a previously cleared area to be used during construction (potential impacts to habitats for conservation significant fauna species are considered under flora and vegetation assessed as an 'other' environmental factor in Section 7).

Theme	Factor	Objective	Consideration
Water	Inland Waters	*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.*	Relevant - assessed as an 'other' environmental factor (Section 7).
Air	Air Quality	*To maintain air quality and minimise emissions so that environmental values are protected.*	Relevant – local air quality has the potential to be impacted by NOx emissions from the Proposal (assessed as a key environmental factor in Section 6.3).
	Greenhouse Gas Emissions	*To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.*	Relevant – the Proposal will give rise to greenhouse gas (assessed as a key environmental factor in Section 6.4).
People	Social Surroundings	*To protect social surroundings from significant harm.*	Relevant – social surroundings to the Proposal have the potential to be impacted by noise (assessed as a key environmental factor in Section 6.5).
	Human Health	*To protect human health from significant harm.*	Relevant – human health has the potential to be impacted by changes in local air quality caused by emissions from the Proposal (assessed under air quality in Section 6.3). Safety risk assessed as 'other' environmental factor (Section 7).

Based on the above assessment, four preliminary key environmental factors relevant to the Proposal have been identified:

- Marine environment quality;
- Air quality;
- Greenhouse gas emissions; and
- Social surroundings.

These preliminary key environmental factors associated with the Proposal are addressed in this referral supporting information document in the following format:

- Statement of Environmental Protection Authority (EPA) objective;
- Discussion of relevant policy and guidance, and summary of how this guidance has been addressed;
- Description of the receiving environment pertinent to the factor;
- Definition of potential direct, indirect, and cumulative impacts on the environmental values for this factor;
- Description of mitigation, including the application of the mitigation hierarchy (avoid, minimise, rehabilitate);
- Assessment of the extent and significance of residual impacts to the environmental values for this factor;
- Description of the predicted environmental outcome as assessed against the EPA objective for this factor.

The following environmental factors are considered relevant as 'other' environmental factors and have been addressed in Section 7:

- Human health;
- Benthic communities and habitats;
- Marine environmental quality;
- Inland waters;

- Flora and vegetation; and
- Terrestrial fauna.

The following factors are not considered to be relevant environmental factors:

- Coastal processes;
- Terrestrial environmental quality;
- Subterranean fauna; and
- Landforms.

6.2 Marine environmental quality

6.2.1 Objective

The objective of the EPA for marine environmental quality is:

> *To maintain the quality of water, sediment, and biota so that environmental values are protected.*

6.2.2 Policy and guidance

The following policy and guidance are relevant to this factor (Table 6.4).

Table 6.2 Policy and guidance relevant to assessment of marine environmental quality

Author	Title	Year of publication
ANZECC & ARMCANZ	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	2018
EPA	Statement of Environmental Principles, Factors and Objectives	2020
	Environmental Factor Guideline - Marine Environmental Quality	2016
	State Environmental (Cockburn Sound) Policy	2015
	Environmental Quality Criteria Reference Document for Cockburn Sound	2017

6.2.3 Receiving environment

Cockburn Sound is reported to have originally been home to more than 4,000 ha of seagrass meadows (Western Australian Auditor General , 2010). The Cockburn Sound Environmental Study in 1979 identified impacts from industrial discharges leading to a deterioration of water quality and widespread loss of seagrass (Department of Conservation and Environment, 1979). A reduction in direct discharges leading to water quality improvements was replaced by impacts from groundwater contamination in the 1980s.

Following widespread loss of seagrass into the 1990s, the 2001 State of Cockburn Sound report recognised the need for a coordinated approach to manage and conserve the environmental values (Cockburn Sound Management Council, 2018). Accordingly, the Environmental Protection (Cockburn Sound) Policy was developed in 2005 and updated in 2015 (EPA, 2015), and an Environmental Management Plan for Cockburn Sound and its catchment (Cockburn Sound Management Council, 2005) were prepared to ensure that the attributes of the sound are protected and enhanced in the future. Extensive monitoring is conducted by various organisations and collated by the Management Council (Cockburn Sound Management Council, 2018).

The environmental quality objectives for Cockburn Sound are to maintain ecosystem integrity, seafood safe for human consumption, aquaculture, primary and secondary contact recreation, aesthetic values, cultural and spiritual values, and water quality for industrial use. Environmental Quality Criteria (EQC) for Cockburn Sound have been established to provide benchmarks for evaluation of whether the environmental quality objectives have been met. The EQCs are available in the reference documentation (EPA , 2017a) developed to support the State Environmental (Cockburn Sound) Policy (EPA, 2015).

An assessment of marine water quality against the EQCs in 2018 (Cockburn Sound Management Council, 2018) reported that the water quality in Cockburn Sound has improved significantly since the 1980s. Values and uses dependent on adequate water quality are being maintained; specifically, seagrass coverage has increased between 1999 and 2017 indicating positive change. Concerns were reported regarding areas of localised poor water quality with reduction in sea grass density at some sites and decline in productivity of some commercial (including aquaculture) and recreational fisheries. The last publicly available assessment of Cockburn Sound marine water quality (2019-2020) determined that the environmental quality objectives were achieved (Cockburn Sound Management Council, 2021).

Environmental Quality Objectives (EQO) are defined in the Sepia Depression Ocean Outlet Monitoring and Management Plan developed by Water Corporation for maintenance of ecosystem Integrity, aquatic life for human consumption, primary and secondary contact recreation and aesthetic values. Environmental Quality Criteria (EQC) are included for receiving water physical, chemical, biological measures and for toxicants in sediments.

The Water Corporation reported that all the EQC for 'Maintenance of Ecosystem Integrity' over the 2020-2021 monitoring period indicate that there is minimal risk to the marine environment due to the discharge of the combined waste stream, including CSBP effluents, into the Sepia Depression (Water Corporation, 2021b).

6.2.4 Potential environmental impacts

The Proposal will result in generation of liquid wastes during construction and operation phases. Stormwater runoff may also increase marginally as the Proposal is partially on developed land and near the existing site stormwater collection system. Around 500 kL/day is expected to be generated from cooling water blowdown from AP3 with a maximum of 1,100 kL/day based on a 1 in 20 year rainfall event over a 24hr period.

6.2.5 Mitigation

In order to ensure the potential impacts to the marine environment are mitigated, CSBP will continue to implement the following measures:

- Discharge wastewater in accordance with current regulatory requirements for quality as specified in the EP Act licence;
- Implementation of the existing Wastewater Management Plan and Liquid Waste Management Plan;
- Continue to investigate methods for optimising the efficiency of the nutrient-stripping wetland; and
- Ongoing contribution to the State ambient monitoring program of Cockburn Sound waters.

In addition, CSBP has committed to either:

- expanding the existing nutrient-stripping wetland (Section 6.2.5.2); or
- installing a Water Recycling Plant (WRP) to enhance the treatment capacity and capability at CSBP Kwinana; or
- reducing cooling tower blowdown in the Chemicals business by increasing the volume of cleaner recycled make-up water to the cooling tower sourced from Water Corporation's KWRP facility.

6.2.5.1 Discharge management

CSBP Kwinana manages stormwater and process effluent (cooling water blow down) by treating this wastewater in an onsite nutrient-stripping wetland system and discharging the treated wastewater to

the environment via the SDOOL. Discharges may also occur directly to Cockburn Sound via an ocean outfall pipe, or under emergency situations via the beach overflow

A review of CSBP Kwinana wastewater discharges was undertaken by Oceanica (2007a); the review examined the issues related to the disposal of wastewater and the risks posed to the marine environment. Discharge data was compared against the EQC for Cockburn Sound, which demonstrated that concentrations were unlikely to have an unreasonable impact on the environment. The review also identified that discharge via SDOOL posed a lower risk due to greater dilution of CSBP wastewater with wastewater from other sources in the pipeline and the greater assimilative capacity of the Sepia Depression compared to Cockburn Sound.

Oceanica (2007a) recommended undertaking Whole of Effluent Toxicity (WET) testing of CSBP wastewater in accordance with the ANZECC/ARMCANZ (2000) and EPA (2005a) water quality management frameworks. This testing was also undertaken in 2007 and concluded that a high level of protection would be attained whether the discharge was to Cockburn Sound or to the SDOOL (2007b).

All wastewater discharges are managed in accordance with conditions contained in EP Act Licence L6107/1967/17. For discharges to the SDOOL, obligations in the Water Services Agreement between the Water Corporation and CSBP Limited also apply. The discharge of wastewater to the SDOOL is governed by the implementation conditions of the Ministerial approval for the KWRP Project (Ministerial Statement No. 665), which allows for up to 208 ML of wastewater to be discharged per day. The Water Corporation can only accept and convey effluent to the Sepia Depression from industry partners where their toxicant loads conform to those permitted to be discharged to Cockburn Sound by their individual EP Act licences (Water Corporation, 2005).

CSBP continues to liaise with Water Corporation to ensure monitoring is undertaken in accordance with the Sepia Depression Ocean Outlet Monitoring and Management Plan, and that CSBP wastewater quality does not adversely impact Water Corporation compliance with regulatory obligations.

CSBP Kwinana has a Wastewater Management Plan in place that covers the appropriate collection, monitoring and discharge management for wastewater that is discharged to the SDOOL. Analysis of cooling tower blowdown water quality is undertaken twice a week, to supplement continuous online monitoring. A number of sample points are maintained around the site to collect representative daily samples from inputs to the containment system.

CSBP Kwinana also has a Liquid Waste Management Plan in place that covers the appropriate handling, storage, and disposal methods for liquid waste, other than process effluents and stormwater, generated on-site.

6.2.5.2 Nutrient-stripping wetland

The CSBP Kwinana nutrient-stripping wetland was constructed as a pilot project in 2004 to treat industrial wastewater prior to discharge to Cockburn Sound and from October 2005 to the SDOOL. In 2006, CSBP engaged Murdoch University (Environmental Technology Centre) to research the performance of the pilot wetland and assist CSBP in optimising wetland performance. Murdoch University recommended the construction of two additional wetland cells with wastewater inlets at the surface and outlets at the base of each cell. The additional cells were designed to enhance bacterial nitrification of ammoniacal nitrogen in the wastewater with the original cell to be used for denitrification to convert the nitrate nitrogen to nitrogen gas.

Consequently, in June 2009, CSBP completed a $2.1 million expansion of the wetland to assist in further reducing the nitrogen load in wastewater prior to discharge and to increase the stormwater holding capacity for the site. The expanded wetland improves the sustainable management of wastewater by providing a permanent treatment option for suitable streams in a low-energy, natural

approach. CSBP continues to investigate methods to optimise the efficiency of the wetland performance.

6.2.5.3 Discharge to SDOOL

Under normal operating conditions, wastewater in the CSBP Kwinana containment system is discharged via the SDOOL. The average wastewater volume currently disposed from CSBP Kwinana through the SDOOL is approximately 2,900 kL/day in accordance with the Water Services Agreement between CSBP and Water Corporation.

The Proposal will result in an increase of between 500 kL (average) to 1,100 kL (maximum) per day of water discharged from AP3. However, this increase in discharge will be offset by the overall reduction in cooling tower blowdown at CSBP's cooling towers in the ammonia and ammonium nitrate plants due to the increase in KWRP consumption by up to 4,400 kL per day[6]. KWRP is a cleaner source of make-up water and, when distributed across the cooling towers in the ammonia and ammonium nitrate plants, it will reduce the total volume of cooling tower wastewater generated. Overall, the Proposal will not result in an increase to the maximum discharge quantity allowed under MS 665 (up to 208 ML per day). CSBP will continue to consult with Water Corporation regarding the change to the current discharge rate allowed in the Water Services Agreement.

During periods of high rainfall, and when pond storage capacity, maximum pump rates and SDOOL capacity may be exceeded, wastewater is permitted to be discharged to Cockburn Sound via two alternative licensed discharge points – the emergency beach outfall and/or the submarine pipeline diffuser. Current operations are such that overflows to the beach and discharges to Cockburn Sound via the diffuser are no longer part of normal operations. In 2018 and 2019, there were no emergency discharges, and there was one discharge to Cockburn Sound in 2020. In 2021, there were eight emergency discharges to Cockburn Sound and two via the beach. This increase in discharges was attributed to an increase in stormwater generated by the unusually high levels of rainfall experienced in 2021 (892mm vs 730mm average).

When discharge of wastewater to SDOOL occurs, a side stream from the discharge pipeline is automatically delivered into a monitoring station where a series of online instruments continuously analyse pH, conductivity, and turbidity. A flow weighted composite sample is also collected for subsequent analysis to demonstrate compliance with relevant EP Act licence parameters.

Table 6.3 shows the licence parameters (limits/targets) applicable to wastewater discharges and the monthly average loads over the 2020/21 period. Discharge limits are prescribed for discharge to Cockburn Sound, should it occur, and concentration targets are applicable for discharge to SDOOL.

Concentrations for daily limits, as stipulated in the EP Act licence, are provided for information. The licence also requires that discharges must be between pH 6.0 to 9.0; a pH between 4.0 and 10.0 on one day in a month is permitted. All concentrations of wastewater discharged via the SDOOL in 2020/21 were within licence limits/ targets. Data related to wastewater discharge volume and quantity are reported to DWER in accordance with the EP Act licence.

The Water Corporation assesses compliance on a quarterly basis in accordance with the Sepia Depression Ocean Outlet Monitoring and Management Plan, which includes sampling and analysis of individual inputs and the combined wastewater flow prior to discharge to the Sepia Depression. During the most recently reported period (2020-2021), monitoring in the vicinity of the SDOOL discharge point determined EQO for ecosystem integrity were met (Water Corporation, 2021a). This analysis includes the CSBP wastewater discharges to SDOOL.

[6] MS 648 allows up to 6,000 kL per day

6.2.5.4 Emergency response

Despite the robust nature of the wastewater management system, there is potential for accidental release of process fluids or effluent that could lead to a discharge of contaminants in the form of liquid ammonia.

Accordingly, an emergency response plan and management procedures have been developed to address a range of potential incidents (such as spills, fire, and transport accidents) that could result in the release of contaminants to Cockburn Sound or the Sepia Depression. Additionally, CSBP is committed to the Kwinana Industries Mutual Aid (KIMA) agreement as part of its leadership of the Kwinana Industries Public Safety Group (KIPS) group, which includes various local industries within the KIA and was established to provide a combined industry response to emergency situations.

Table 6.3: Summary of 2020/21 discharges to marine environment

Parameter	Licence Limit	Measured monthly load (kg/day)												Licence limit
	Monthly average daily load limit (kg/day)	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	mg/L (daily limit)
Total Organic Nitrogen	200[a]	175	103	80	64	92	56	54	72	57	64	107	170	-
Orthophosphate	100[a]	15	14	11	7	9	6	5	6	7	8	13	21	-
Arsenic (Inorganic)	-[b]	0.028	0.028	0.023	0.018	0.021	0.018	0.014	0.019	0.021	0.024	0.032	0.039	0.1
Cadmium	-[b]	0.082	0.079	0.062	0.069	0.074	0.068	0.069	0.072	0.065	0.069	0.074	0.082	0.036
Copper	-[b]	0.082	0.079	0.062	0.069	0.074	0.068	0.069	0.072	0.065	0.069	0.074	0.082	0.285
Free Cyanide	-[b]	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Fluoride	54[a]	5	5	4	5	5	5	5	5	4	5	5	6	-
Mercury	0.020	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.0014
Molybdenum	-[b]	0.082	0.079	0.063	0.069	0.074	0.068	0.069	0.072	0.065	0.069	0.074	0.082	0.25
MDEA	-[b]	-	-	-	-	-	-	-	-	-	-	-	-	16.0
Zinc	-[b]	0.084	0.079	0.073	0.074	0.089	0.074	0.115	0.105	0.126	0.094	0.078	0.143	2.25

a. These limits are three monthly rolling averages (kg/day)

b. No daily load limit stated in Licence

6.2.6 Assessment and significance of residual impacts

There will be no increase to the average discharge volume of process wastewater to the SDOOL from CSBP Kwinana from the implementation of the Proposal. Further, concentrations will not change from those previously assessed and subsequently monitored. Overall, the Proposal will not result in an increase to the approved maximum discharge quality from SDOOL due to the increase in KWRP consumption.

Therefore, CSBP considers the potential environmental impacts are adequately addressed by previous assessments and by the ongoing monitoring, which, to date, shows that the environmental protection objectives are being met.

The current EP Act licence contains a combination of concentration and load-based limits for contaminants in wastewater to ensure environmental protection objectives continue to be met. The composition of wastewater that is to be discharged into the SDOOL as a result of the Proposal will continue to meet the requirements of the licence.

6.2.7 Environmental outcomes

As the quality of wastewater currently discharged to the marine environment is not expected to change as the result of the discharge of similar wastewater from the Proposal; and as the discharge will continue to be managed within the existing liquid waste management system and under existing regulatory conditions, it is anticipated that the EPA's objective in relation to the marine environmental quality will be met.

6.3 Air quality

6.3.1 Objective

The objective of the EPA for air quality is:

To maintain air quality and minimise emissions so that environmental values are protected.

6.3.2 Policy and guidance

The following policy and guidance are relevant to this factor and have informed planning for the Proposal (Table 6.4).

Table 6.4 Policy and guidance and relevant to assessment of air quality

Author	Title	Year of publication
EPA	Statement of Environmental Principles, Factors and Objectives	2020
EPA	Environmental Factor Guideline: Air Quality	2020
National Environment Protection Council (NEPC)	National Environment Protection Measure for Ambient Air Quality (Ambient Air Quality NEPM)	2021

The Ambient Air Quality NEPM defines air quality standards for criteria pollutants, including carbon monoxide, nitrogen dioxide, photochemical oxidants (as ozone), sulfur dioxide, lead and particles (as PM_{10} and $PM_{2.5}$).

During normal operations, air emissions from the Proposal will be directed to atmosphere via the auxiliary boiler stack and primary reformer stack. The primary pollutant of concern from these emission points is oxides of nitrogen (NO_X). Emissions of ammonia and other volatile gases may be released under upset conditions but will be combusted via flare.

The Ambient Air Quality NEPM standards[7] relevant to the Proposal are tabulated below (Table 6.5).

Table 6.5 Air quality standards

Pollutant	Averaging period	Maximum concentration standard	
		ppm	µg/m³ referenced to 25°C and 101.3 kPa
NO_2	1 hour	0.08	151
	1 year	0.015	28

The Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999 (and the 2019 redetermination) and Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992, while relevant to the KIA, do not contain ambient air quality criteria relevant to the Proposal.

6.3.3 Receiving environment

6.3.3.1 Sensitive receptors

Nearby sensitive receptors include residential developments, recreational facilities, a childcare facility, and a school (Figure 2.4). The location of the sensitive receptors is in the suburbs of North Rockingham, Leda, Calista and Medina.

6.3.3.2 Topography

The site is situated on the coastal flats at approximately 5 mAHD, with a line of dunes with elevations of up to 60 mAHD running north-south approximately 4 km to the east, as depicted in Figure 6.1.

The flat coastal topography is not expected to influence the meteorology or air quality at receptors close to the Proposal, which are situated along the coast to the west of the low hills that could act as a natural barrier for low level emission plumes.

6.3.3.3 Existing air quality

The local airshed receives pollutants from other nearby CSBP operated industrial facilities, as well as further industry sources in the KIA.

The existing air quality, including NO_2 concentrations, is monitored at the DWER Rockingham air quality monitoring station located approximately 3.5 km to the southwest of the Proposal. The next closest station to the Proposal that monitors NO_2 is located at South Lake to the northeast[8].

DWER air quality data is made publicly available in an annual air quality report. The most recently reported data (2021 calendar year) for NO_2 measured at Rockingham is presented below (Table 6.6).

Table 6.6: Background air quality (NO_2) at DWER Rockingham 2021

Period	Data availability	Max conc	99th percentile	98th percentile	95th percentile	90th percentile	75th percentile	50th percentile
		ppm						
1-hour averages	99.8%	0.037	0.028	0.027	0.025	0.023	0.016	0.011

The maximum hourly NO_2 value recorded during the 2021 calendar year (0.037 ppm) was below the Ambient Air Quality NEPM standard current at the time (0.12 ppm) and the contemporary standard (0.08 ppm), which was adopted in May 2021. The annual average NO_2 of 0.005 ppm recorded at Rockingham was comparable to other DWER monitoring sites across the Perth region.

Industry in the KIA contributing greater than 1% of the total NO_X emitted to the airshed, as reported to the National Pollutant Inventory (NPI), is summarised below (Table 6.7). Notably, the BP Refinery,

[7] DWER adopted the NEPM standards for the ambient air quality guideline values in the 2019 draft Guideline Air Emissions. The NEPM NO_2 criteria have since been refined and the air emissions guideline remains in draft; therefore, the revised NEPM values take precedent.

[8] A DWER monitoring station is located at Wattleup, but this station only monitors sulphur dioxide.

which was the second-largest emitter, ceased operating in March 2021; therefore, the background NO_X concentrations in the airshed since this event, and going forward, are expected to be lower than previous periods.

Table 6.7: Oxides of nitrogen emissions reported for NPI 2020/2021

Company	Facility	2020/2021 (kg)	%
Alcoa of Australia	Kwinana Alumina Refinery	1,750,000	34%
BP Refinery (Kwinana) Pty Ltd	BP Refinery (Kwinana)	874,801	17%
CSBP Limited	CSBP Kwinana Operations	612,074	12%
Electricity Generation & Retail Corporation	Kwinana Power Station	397,616	8%
Summit Kwinana Power Pty Ltd & ERM Kwinana Power Pty Ltd	Newgen Power Kwinana Partnership	377,906	7%
IPM Operation & Maintenance Kwinana Pty Ltd	Kwinana Cogeneration Plant	321,887	6%
Wesfarmers LPG Pty Ltd	Kleenheat Gas, Kwinana Production Facility	313,288	6%
BHP Billiton Nickel West Pty Ltd	Kwinana Nickel Refinery	271,422	5%
Tronox Management Pty Ltd	KMK Cogeneration Plant	114,688	2%
Tronox Management Pty Ltd	Kwinana Pigment Plant	73,020	1%

6.3.4 Potential environmental impacts

The Proposal has the potential to impact human health via emissions to air causing a reduction in ambient air quality.

Oxides of nitrogen will be the principal air pollutant arising from the Proposal. NO_x will be emitted from the primary reformer (major source) and the auxiliary boiler. Minor NO_X emissions will also be generated from the flare.

Emissions of NOx include NO_2 as well as NO which has the potential to be converted to NO_2 in the atmosphere. High concentrations of NO_2 can be harmful to the respiratory system and exacerbate pre-existing respiratory conditions such as asthma.

The Ambient Air Quality NEPM includes criteria for ambient NO_2; reporting standards for 1-hour and annual average NO_2 were reduced to 80 ppb and 15 ppb respectively in May 2021. The reduction in the NO_2 air quality standard was in response to a comprehensive review finding evidence of consistent associations between NO_2 levels and hospital admissions and mortality (DLA, 2018). NO_X also contributes to photochemical smog formation (WPC DEP, 1996).

Emissions of sulphur oxides (SO_x) to air from the Proposal will be limited due to the requirement to remove sulphur from the process gas stream in order to mitigate downstream process catalyst deactivation. Desulphurisation is achieved via catalytic hydrogenation of organic sulphur compounds and subsequent adsorption onto a zinc oxide catalyst to form zinc sulphide.

Some emission of SO_x to air will occur from combustion of fuel gas in the boiler and primary reformer. Emissions of SO_x to air are estimated to be approximately 0.6 parts per million (ppm); therefore, projected total emissions will be low (less than 2 grams per second) and are not considered further in the air quality assessment.

Emissions of ammonia and other gases from controlled points and depressurisation devices are captured and combusted in the flare prior to discharge to air. Combustion of fugitive species, including ammonia, will mitigate potential odour emissions.

Emergency flaring only occurs during plant trips which are expected infrequently and are expected to have minimal impacts on air quality. Plant trips do not result in any other elevated emissions to air.

Figure 6.1: Topography

Legend CSBP Kwinana Development Envelope Topographic contours (mAHD)	Scale 1:35,000 at A4 (0 250 500 metres)	**Lot 20 Kwinana Beach Road Kwinana WA 6167**
	Coord. Sys. GDA2020 MGA Zone 50	**TOPOGRAPHY**
	Job No: 60751	
	Client: CSBP	**FIGURE 5.1**
	Version: A / Date: 22-Jul-2022	strategen JBS&G
	Drawn By: ianandagoda / Checked By:JB	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\CSBP\60751 Kwinana AP3 s38 referral\GIS\Maps\R01_Rev_A\60751_05_1_Topography.mxd
Image Reference: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

6.3.5 Mitigation

The technology to be employed to control NOx emissions from the ammonia plant include:

- Employment of low NO_X burners in the primary reformer, which are considered best available technology.
- Implementation of online process monitoring to alert process operators of ammonia carry over from the ammonia recovery unit to the off-gas stream to the primary reformer fuel supply system, which can lead to increased NOx emissions
- Optimisation of air flow to the auxiliary boiler; and
- Quarterly stack testing will be conducted to monitor actual emissions and ensure they are below the required range.

Predicted ground level impacts are within the applicable standards; therefore, no further mitigation measures are proposed for NO_X emissions from the Proposal.

6.3.6 Assessment and significance of residual impacts

6.3.6.1 Air quality assessment methodology

An Air Dispersion Modelling Study for the Proposal has been completed (Ramboll 2021; Appendix B). AERMET was used to prepare the metrological input data obtained from Hope Valley 1996 (Figure 6.2). Moderate easterlies are evident in the dataset, along with strong westerlies through south-westerlies.

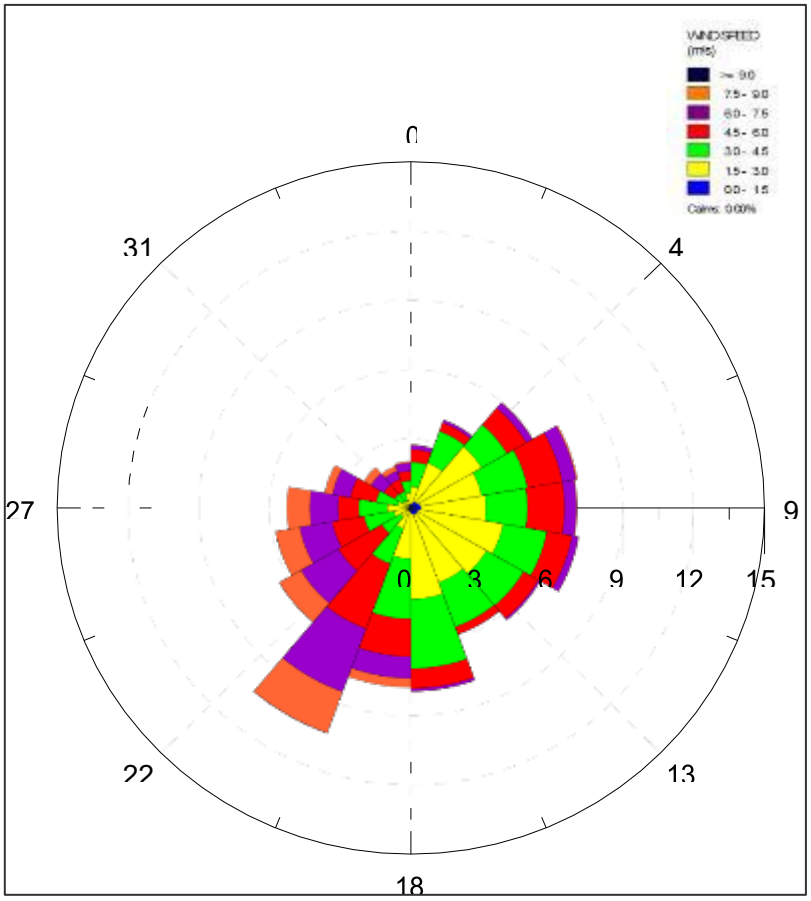

Figure 6.2: Hope Valley 1996 wind rose

Modelling of the NO_X emission sources from the Proposal was conducted using both AERMOD and DISPMOD. These two Gaussian dispersion models were employed since neither model could be identified as the most conservative approach.

AERMOD includes the Plume Rise Model Enhancements (PRIME) building downwash algorithms, which provide a more realistic handling building wake effect on plume dispersion; while DISPMOD, developed for modelling elevated sources on the Kwinana Coastline, better accounts for coastal influences on plume dispersion. Similarly, AERMOD was run in both urban and rural mode and the higher concentration for each grid point selected, as neither approach was most conservative for both near-field and far-field locations. Further details on the modelling approach are presented in Appendix B.

Ground Level Concentration (GLC) predictions were determined across an 8 km square grid including discrete sensitive receptors representing residential dwellings and recreational locations.

The modelling included two NO_X emissions sources for the Proposal. The existing AP2 and the nitric acid plants in the CSBP Kwinana Industrial Complex are entirely separate from the current Proposal and, therefore, emissions from these plants will not change.

The conservative assumption that 100% of NO_X was emitted as NO_2 was applied for the air quality assessment; in reality, the conversion reaction of NO to NO_2 can take place over a number of hours in the atmosphere.

Cumulative impacts with other industry in the Kwinana area was conducted by addition of the 75th percentile hourly average detected at the DWER Rockingham air quality monitoring station.

6.3.6.2 Predicted impacts

Maximum GLCs predicted to occur close to the CSBP Kwinana boundary are presented in Table 6.8.

Table 6.8: Summary of maximum predicted NOx GLCs from Proposal under normal operation

Averaging period	NO_2 guideline µg/m3	Maximum predicted GLC (isolation)		Background concentration	Predicted cumulative GLC	
		µg/m³	% Guideline	µg/m³	µg/m³	% Guideline
1-hr	151	55.3	37%	30.1	85.4	57%
Annual	28	3.2	11%	7.5	0.7	38%

The maximum predicted 1-hour average NO_2 GLC from the Proposal in isolation during normal operations, predicted by AERMOD to occur at an identified sensitive receptor, was 37% of the criterion for NO_2. The addition of airshed background raises the predicted GLC to 57% of the 1-hour Ambient Air Quality NEPM criteria for NO_2.

The maximum annual average NO_2 GLC from the Proposal in isolation during normal operations was predicted by AERMOD to occur close to the boundary and be 11% of the criterion for NO_2. Addition of airshed background raises the predicted GLC to 38% of the annual Ambient Air Quality NEPM criteria for NO_2.

The maximum GLCs at sensitive receptors are presented in Table 6.9, including an evaluation of the cumulative impact with background assessed against the relevant NEPM criteria.

Concentration isopleths (contours) for the Proposal (without background) are presented in Figure 6.3 to illustrate the predicted dispersion. The maximum predicted 1-hour average NO_2 receptor GLC from the Proposal during normal operations plus background (cumulative) was 27% of the NEPM criterion for NO_2; this occurred at the Wombat Wallow childcare facility.

The maximum cumulative annual average NO_2 receptor GLC from the Proposal during normal operations was 27% of the criterion for NO_2. The maximum annual average for sensitive receptors were predicted at Wells Park (Figure 6.4).

Table 6.9: Summary of maximum predicted NO_2 GLCs at receptors from the Proposal

Receptor	1-hour maximum predicted GLC µg/m³	1-hour maximum predicted cumulative[1] GLC µg/m³	Cumulative % of 1-hour guideline[2]	Annual predicted GLC µg/m³	Annual predicted cumulative[3] GLC µg/m³	Cumulative % annual guideline[4]
Wells Park	9.9	40.0	26	0.2	7.7	27
Golf Course	8.3	38.4	25	0.1	7.6	27
Thomas Oval	10.7	40.8	27	0.2	7.7	27
Oval	8.3	38.4	25	0.2	7.7	27
Nearest Residence	8.2	38.3	25	0.1	7.6	27
North Rockingham	5.5	35.9	24	0.1	7.6	27
Residence 3 (SE)	8.0	30.1	25	0.1	7.6	27
Hope Valley	5.5	30.1	24	0.1	7.6	27
Calista Primary School	7.5	30.1	25	0.1	7.6	27
Wombat Wallow	10.4	30.1	27	0.1	7.6	27

1. Including background of 75th percentile of daily peak one-hour NO_2 – 2021
2. NEPM 1-hour criteria 151 µg/m³
3. Including background annual average monitored NO_2 – 2021
4. NEPM annual criteria 28 µg/m³

Figure 6.3: 1-hour Average NO_2 GLC (µg/m³) from Proposal in isolation (NEPM standard 151 µg/m³)

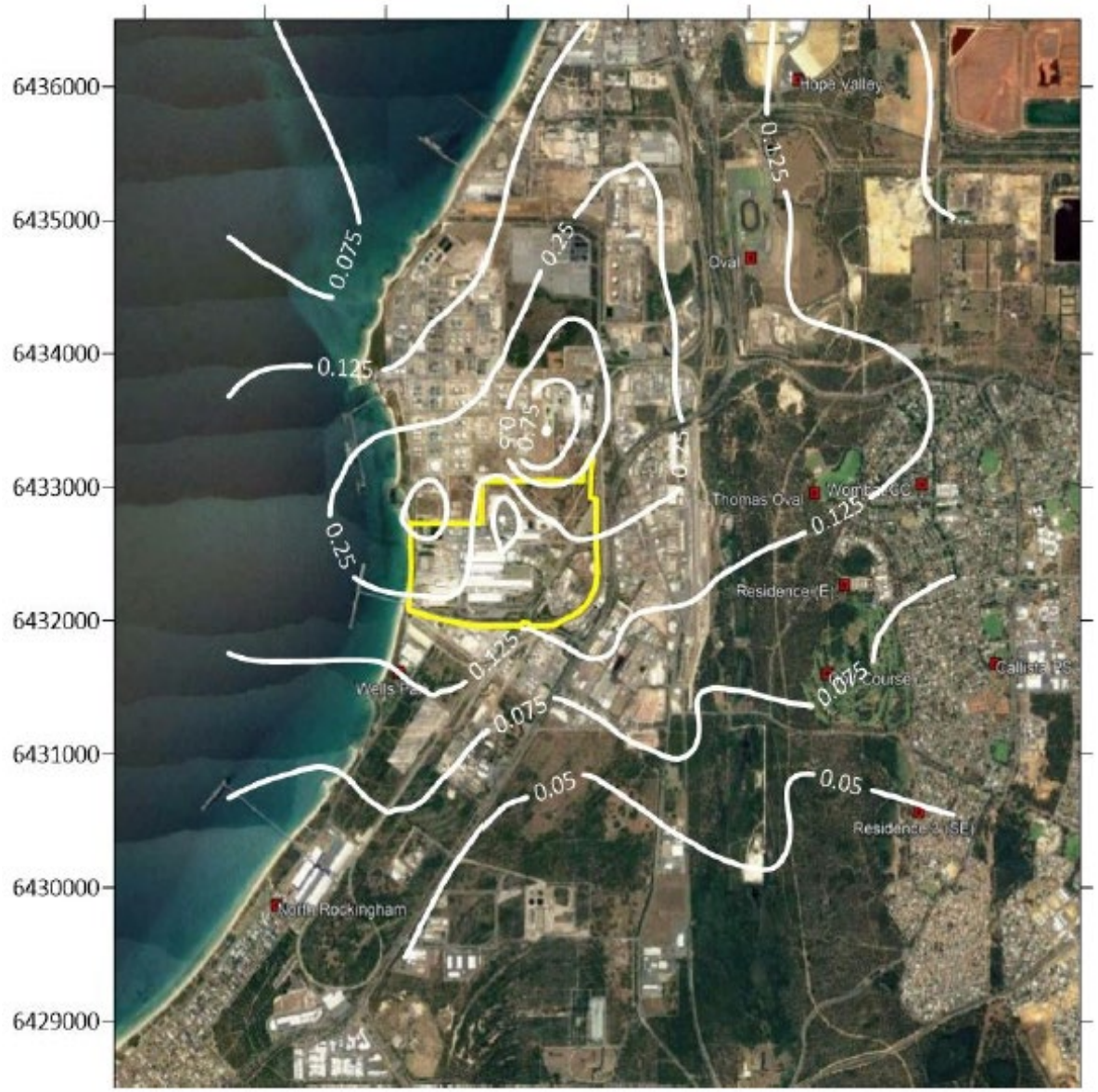

Figure 6.4: Annual average NO_2 GLC (µg/m^3) from Proposal in isolation (NEPM standard 28 µg/m^3)

6.3.7 Environmental outcomes

The air dispersion modelling assessment indicates that emissions of NO_X associated with the Proposal are not likely to result in unacceptable air quality impacts. Therefore, it is expected that the EPA's objective in relation to air quality will be met.

6.4 Greenhouse gas emissions

6.4.1 Objective

The objective of the EPA for greenhouse gas (GHG) emissions is:

> *To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.*

6.4.2 Policy and guidance

A summary of the relevant policy and guidance for GHG emissions is provided in Table 6.10.

Table 6.10: Air Quality – Greenhouse Gas Policy and guidance

Author	Title	Year of Publication
EPA	Statement of Environmental Principles, Factors and Objectives	2020
	Environmental Factor Guideline: Greenhouse Gas Emissions	2020
Government of Western Australia	Western Australian Climate Policy	2020
	Greenhouse Gas Emissions Policy for Major Projects	2019
Commonwealth	*National Greenhouse and Energy Reporting Act 2007* (NGER Act)	2007
	National Greenhouse and Energy Reporting (Measurement) Determination 2008	2008
	National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015	2015

The Australian Government Clean Energy Regulator administers the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). The NGER Act and related instruments establish the national framework for reporting greenhouse gas emissions, greenhouse gas projects and energy consumption and production by corporations in Australia.

The Western Australian Government's Greenhouse Gas Emissions Policy for Major Projects (the State GHG Policy) states the commitment of the State Government to work with all sectors of the Western Australian economy to achieve net-zero GHG emissions by 2050 (Department of Environmental Regulation, 2019). Furthermore, the State GHG Policy states the commitment to working with the Commonwealth Government's interim target of emission reductions of 26 to 28 per cent by 2030 (Government of Western Australia, 2019).

The State GHG Policy is designed to guide Government decision making for major projects that are assessed by the EPA under Part IV of the EP Act. In accordance with the policy, the Minister for Environment will consider the characteristics of each project and the advice and recommendations of the EPA. The Government may then consider whether it is appropriate to apply a condition that sets out the requirements for a plan detailing CSBP's contribution towards achieving the Government's aspiration of net zero emissions by 2050.

The Policy is applicable to new significant proposals designated large facilities under the Safeguard Mechanism (net emissions exceed the safeguard threshold of Scope 1 covered emissions of more than 100,000 tonnes of carbon dioxide equivalent [CO_2-e] per year).

The EPA's greenhouse gas emissions environmental factor guideline requires proponents of major greenhouse emitting projects to show how they can reasonably and practically avoid, reduce, and offset emissions over the lifetime of a project to contribute to the State's aspiration of net zero emissions by 2050. The requirements of the guideline have been considered in this assessment.

6.4.3 Receiving environment

Australia, along with many other global regions, is experiencing a changing climate with warming trends and extreme weather events (CSIRO and Bureau of Meteorology, 2021). Specifically, the impacts of climate change already experienced in Western Australia include:

- Increase in the average temperature of 1.3^{o}C since 1910;

- Decline in rainfall in the far west and southwest while an increase has been recorded over most of Western Australia;
- Increase in number of days with high bushfire risk conditions; and
- A decline in tropical cyclones over the period 1981/82 – 2017/18.

Future climate change projections predicted for Western Australia by mid-century include:

- A continued rise in temperatures (projections dependent on global GHG emissions scenario);
- A projected increase in the number of very hot days (> 40 °C) in Perth from 1.5 to 5 per year;
- A more extended fire season with 40% more high fire danger days;
- A rise in sea level of 24 cm;
- Increased intensity of extreme rainfall events;
- As a whole, Western Australia is likely to become drier - Rainfall change is unclear in the monsoonal north, but ongoing significant declines in southwest Western Australia are likely; and
- A projected 12% decrease in tropical cyclones.

6.4.4 Potential environmental impacts

National and international GHG reporting standards define a set of distinct classes (scopes) of GHG emissions that delineate sources and associated responsibilities. Scope 1 GHG emissions are the emissions released to the atmosphere as a direct result of an activity or a series of activities at a facility level. Scope 2 GHG emissions are the emissions from the consumption of an energy product. Scope 3 emissions are indirect GHG emissions other than Scope 2 emissions that are generated in the wider community, which occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business (Australian Government Clean Energy Regulator, 2021).

GHG emissions are expressed in CO_2-e, which is an aggregate of GHG emissions, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and nitrogen trifluoride (NF_3) calculated as an equivalent CO_2 emission by factoring in the global warming potential (GWP) of each gas. GWP is applied in accordance with National Greenhouse and Energy Reporting (Measurement) Determination 2008.

Calculations have been undertaken using the methodologies described by the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines (Australian Government Department of Industry, Science, Energy and Resources, 2020), which provide guidance and commentary to assist reporters in estimating GHG emissions for reporting under the NGER Act.

The ammonia production process involves the use of methane, steam, and air as inputs; and generates ammonia, CO_2, and water condensate as outputs (Section 2.1.4). The Proposal will therefore result in GHG emissions over the lifetime of the project.

GHG emissions will add to global GHG concentrations with the potential to contribute to climate change influenced by changes to global GHG emission concentrations.

Forecast Scope 1 GHG emissions of 539,003 CO_2-e tpa from the operation the Proposal exceed the 100,000 t CO_2-e per year threshold. GHG emissions are thus identified as a key environmental factor for assessment (EPA, 2020a). The origin of the GHG emissions during construction and operational phases are summarised in the following sections (Section 6.4.4.1 and Section 6.4.4.2, respectively) and detailed in the GHG Management Plan (Appendix C).

6.4.4.1 Estimated emissions during construction

The direct (Scope 1) GHG emissions during the construction phase of the Proposal will be predominantly related to the combustion of diesel by stationary and mobile equipment. A total of 19,505 tonnes CO_2-e Scope 1 emissions has been estimated for the construction period, anticipated to occur over approximately 2.5 years.

Some indirect (Scope 2) emissions from the consumption of electricity from the grid may also occur during the construction period; however, these are expected to displace Scope 1 emissions described above. Net Scope 1 and Scope 2 emissions are, therefore, expected to be at or below the predicted Scope 1 emissions.

Scope 3 emissions associated with construction have not been estimated at this time due to the high uncertainty during the current phase of the Proposal.

6.4.4.2 Estimated emissions during operations

The main contributors to Scope 1 GHG emissions during operation of the Proposal will be:

- Feed natural gas contributing approximately 69 per cent of the Scope 1 emissions;
- Fuel natural gas contributing approximately 28 per cent of Scope 1 emissions; and
- Steam boiler and pilot flare contribute approximately 3 per cent of Scope 1 emissions.

Annual Scope 1 emissions of 539,003 t CO2-e per year are predicted (Appendix C) with a total of 6,468,031 tonnes over the life of the project, with interim emissions reduction actions. Therefore, in the absence of any emissions reductions, a total of 12,397,060 tonnes CO_2-e would be expected over the operating lifespan.

During initial plant start-up, an electricity source is required for approximately 72 hours. This initial electricity will be sourced either internally from the CSBP Kwinana facilities or alternatively from the SWIS.

When the plant is operating, electricity will be generated from the waste heat recovery system. During normal operations, CSBP expects that the electricity generated by AP3 will meet circa 70% of the consumption requirements. This includes 4.4 MW of electricity to operate the 10 MW electrolyser. The remaining 5.6 MW for the electrolyser will be sourced by power purchase agreements (PPA) with renewable electricity providers and supplied through the SWIS.

CSBP will purchase sufficient annual renewable electricity certificates (RECs), through the PPA, for the supply of renewable electricity for continuous operation of the electrolyser. Using the standard emission factor for the SWIS (0.68 kgCO_2-e/kWh) maximum Scope 2 emissions of 33,735 tCO_2-e per annum would be avoided by the purchase of RECs.

Scope 3 emissions from the value chain activities provided in the GHG Protocol (WRI, 2013) applicable to the Proposal are limited to upstream fuel and energy-related activities (Appendix C). Scope 3 emissions of 42,961 tonnes CO_2-e emissions per annum will be generated by natural gas exploration, production, processing, and transmission for use as feed and fuel in the Proposal.

Implementation of the Proposal will reduce the production and import of 300,000[9] tpa ammonia from third party sources leading to avoidance of 606,170 tonnes CO_2-e of Scope 3 emissions per annum. Offsetting the Scope 3 emissions generated by natural gas upstream activities, the Proposal will achieve a net reduction of 563,210 tonnes CO_2-e of Scope 3 emissions per annum.

[9] The projected ammonia import volume takes into account increased ammonia requirements from potential debottlenecking of CSBP chemical facilities, and long-term increase in offtake volumes by external customers.

Scope 3 emissions generated by activities downstream of ammonia production are expected to remain unchanged due to the direct displacement of imported ammonia with manufactured ammonia.

6.4.4.3 Total emissions

A summary of the anticipated GHG emissions for the Proposal is shown below (Table 6.11).

Table 6.11: Summary of GHG emissions

Project phase	Scope 1	Scope 2	Scope 3
Construction	19,505 tCO_2-e total	None identified	ND
Operation	539,003 tCO_2-e per annum	Offset 33,735 tCO_2-e per annum via purchase of RECs	42,961 tCO_2-e per year generated (gas supply) 606,170 tCO_2-e per annum avoided (import substitution) Net 563,210 tCO_2-e per annum avoided

6.4.4.4 Contribution to regional, state, national and global emissions

To inform the assessment of the impact of emissions from the Proposal, the maximum annual estimated Scope 1 emissions have been compared against Western Australian, domestic, and global yearly anthropogenic emissions (Table 6.12). The analysis uses emissions data reported for the 2020 calendar year as this is the most recent complete dataset.

Table 6.12: Comparison against State, national and global GHG emissions

Description	Total 2020 annual GHG emissions $MtCO_2$-e	Scope 1 maximum annual emissions 0.54 $MtCO_2$-e
Western Australia[10]	81.7	0.7%
Australia[8]	532.5	0.1%
Global[11]	54,963	0.001%

6.4.5 Emissions intensity and benchmarking

The predicted ammonia production intensity of the Proposal is 1.741 tonnes CO_2 per tonne ammonia (Scope 1 steam methane reforming process only) or 1.797 tonnes CO_2 per tonne ammonia (including flare but without Scope 2 emissions to be met by purchasing renewable energy). The predicted Proposal intensity is below the Safeguard Mechanism default emission intensity of 1.87 tonnes CO_2 per tonne ammonia for the steam methane reforming process only.

Benchmarking of the Proposal has been conducted (CRU, 2021) against emission intensities for Australian and global ammonia plants of similar production capacities (Figure 6.5). While plants from the worldwide ammonia production industry were reviewed, plants operating under similar laws and regulations, such as USA and Europe, were preferentially selected. Of the plants selected, seven use natural gas as feed stock (the same feedstock as the Proposal); one used heavy fuel oil (HFO), and one used coal. The two plants using HFO and coal, respectively, were included to highlight the differences in intensity associated with the different feedstocks.

[10] State and Territory Greenhouse Gas Inventories 2020 (Australian Government Department of Climate Change, Energy, the Environment and Water 2022)

[11] Global emissions estimate for 2020 is not currently available in the 2021 emissions gap report (UNEP 2022) with data for methane, nitrous oxide, and fluorinated gases not yet available. The number provided in Table 6.12 was calculated based on a reported 5.4% drop on 2019 fossil fuel derived CO_2 emissions applied across all GHG sources, the actual drop in total GHG emissions is anticipated to be smaller thus this is a conservative position for estimating the % contribution.

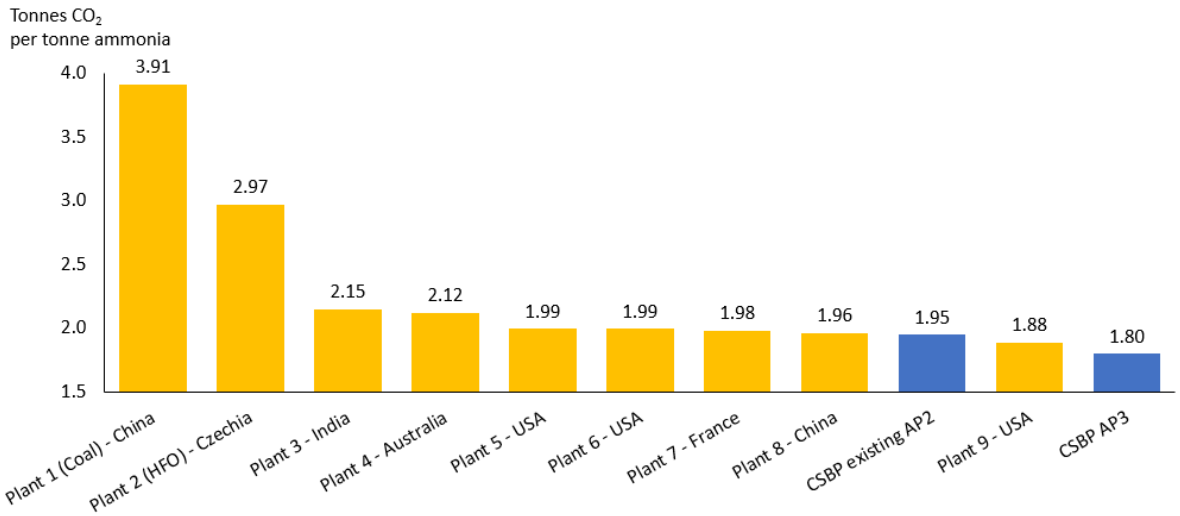

Figure 6.5: Benchmarking emission intensities for assets with similar capacities to AP3 (2020 data)

As highlighted by the benchmarking, the expected emission intensity for the Proposal is low when profiled globally to assets of similar operating capacity.

In addition to the benchmarking, a global carbon curve covering 87% of the global ammonia production was developed (Figure 6.6). The model was developed by CRU, an independent consultant and market analyst specialising in fertiliser, metals and mining engaged by CSBP. The data used for developing the carbon curve was sourced from CRU's primary research and database[12] and assumed consistent CO_2-e per GJ to enable fair comparison. Emissions from both the feedstock required for fuel and feed, as well as any additional power needed for the production process, from either on-site or off-site sources are included. Emission estimates do not account for the CO_2 released as part of the raw material hydrocarbon extraction process or subsequent sale or use of CO_2 emitted from the process.

The CO_2 intensity for natural gas-fuelled ammonia production plants was determined to range from 1.5 tonnes CO_2 per tonne ammonia to 2.2 tonnes CO_2 per tonne ammonia. The steep change in ammonia production and emission intensity shown in the global carbon curve is due to the different feedstocks used in the production process. As shown by the curve, the emissions intensity predicted for the Proposal is in the lower quartile when profiled globally. The global comparison comprises of small and large scale ammonia facilities. Facilities that position to the left of the AP3 carbon intensity point on the carbon curve are predominantly mega-scale facilities which are inherently more energy efficient.

[12] CRU is an independent market analyst specialising in data and consulting for the fertiliser and mining and metals industry. The benchmarking can be shared upon request.

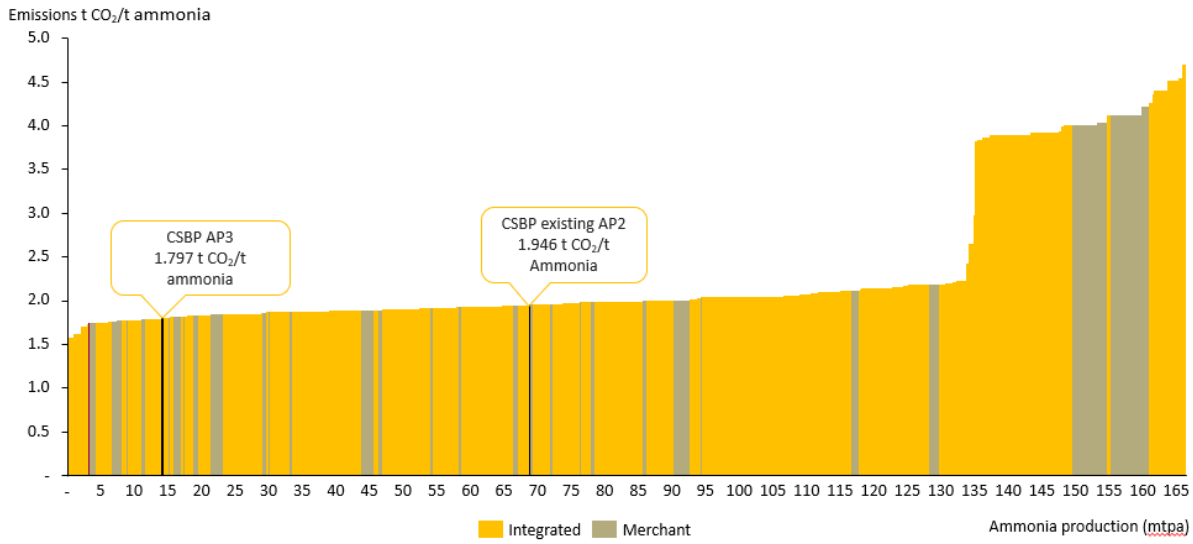

Figure 6.6: AP3 emission intensity position relative to global ammonia producers (2020 data)

6.4.6 Mitigation hierarchy application

6.4.6.1 Emission avoidance

The measures summarised below (detailed in Appendix C) have been applied during the design phase and result in avoidance (and reduction) of the Proposal GHG baseline emissions:

- Addition of 10 MW electrolyser to be powered from the waste heat recovery system and purchased renewable electricity (17,150 tonnes CO_2-e/annum Scope 1);
- Primary reformer optimisation and automation to reduce heat flux and natural gas consumption (18,400 tonnes CO_2-e/annum Scope 1);
- Enhanced process heat recovery to increase electricity generation and reduce consumption from the grid (22,600 tonnes CO_2-e/annum Scope 2);
- Substitution of gas-fired start-up heater with electric which is more energy efficient (380 tonnes CO_2-e/annum Scope 2);
- Proposal footprint optimisation to use existing cleared locations and minimise further clearing of vegetation (1,150 tonnes CO_2-e Scope 1).
- Leveraging of existing infrastructure avoiding GHG emissions associated with duplicate facilities (150 tonnes CO_2-e/annum Scope 1 and 2); and
- Expansion of sulphur bed to extend the duration between plant shutdowns required for sulphur removal catalyst (zinc oxide) replacement, reducing the number of start-ups which rely on electricity (150 tonnes CO_2-e/annum Scope 2).

6.4.6.2 Emission reduction

The following measures were identified during the FEED phase to achieve further reduction of the GHG emissions:

- Reduction of pressure drop to reduce syngas compressor power consumption (1,700 tonnes CO_2-e/annum Scope 1 and 2,100 tonnes CO_2-e/annum Scope 2;
- Heat loss minimised by implementation of best available insulation and refractory technology 2,600 tonnes CO_2-e/annum Scope 1;

- Low energy and high-efficiency plant and equipment selected including larger steam turbine condenser, higher capacity cooling tower, additional heat exchange capacity, premium efficiency motors and light emitting diode (LED) lighting (1,200 tonnes CO_2-e/annum Scope 1 and 3,200 tonnes CO_2-e/annum Scope 2; and
- Optimisation of packing in towers to enhance CO_2 removal via amine solution (400 tonnes CO_2-e/annum).

6.4.6.3 Emissions mitigation

The GHG Management Plan details targets and mitigation methods to reduce GHG emissions to meet net zero by 2050 (Table 6.13). The interim targets are structured to first mitigate high purity CO_2 emissions (~70% project CO_2 emissions), from the steam methane reforming process, then the low purity stream from combustion of natural gas.

Table 6.13: GHG mitigation overview

Timing	Estimated Scope 1 emissions (tpa CO_2-e)	Reduction from baseline (%)	Mitigation methods
Start of operations to 2029	539,003	-	-
2030 to 2034 (Interim 1)	377,302	30	CCS, CCU and green hydrogen feed
2035 to 2039 (Interim 2)	323,402	40	CCS, CCU and green hydrogen feed
2040 to 2044 (Interim 3)	161,701	70	CCS, CCU and green hydrogen feed
2045 to 2049 (Interim 4)	107,801	80	CCS, CCU and green hydrogen feed + fuel
2050 onwards (Long-term)	0	100	CCS, CCU and green hydrogen feed + fuel

6.4.7 Assessment and significance of residual impacts

A contribution of 0.7% to the total state emissions is not considered a significant increase (Table 6.12). However, given CSBP's commitment to meet a net-zero by 2050 target, a GHG Management Plan has been developed (Appendix C).

In accordance with EPA factor guidance (EPA 2020a)[13], the GHG Management Plan includes the application of the mitigation hierarchy to avoid, reduce, or mitigate emissions, a GHG emissions reduction program with clear targets, and associated monitoring, defined trigger and thresholds and management responses. The management provisions are summarised in the previous section (Section 6.4.6).

6.4.8 Environmental outcomes

It is expected that the Proposal will result in the following residual impacts and outcomes in relation to GHG emissions:

- Maximum Scope 1 emissions of up to 539,003 tonnes CO_2-e per annum;
- Scope 1 emissions will contribute an annual maximum of approximately 0.6% to State emissions, 0.1% to national emissions and 0.001% to global emissions;
- The Scope 1 emissions will be reduced by 30% in 2030, 40% in 2035, 70% in 2040, 80% in 2045 and 100% by 2050;
- Should emissions targets not be realised, offsets will be purchased to meet the commitments in the GHG Management Plan; and
- GHG emissions associated with the Proposal will not impede the State GHG Policy aspiration of net zero emissions by 2050.

[13] A revised version of the GHG factor guideline was released as a draft for public review in July 2022.

Following the application of the mitigation measures and reduction targets, no significant residual impacts have been identified. Therefore, it is considered that the EPA's management objective for Greenhouse Gas Emissions will be met.

6.5 Social surroundings (noise)

6.5.1 Objective

The objective of the EPA for social surroundings is:

To protect social surroundings from significant harm.

6.5.2 Policy and guidance

The following policy and guidance are relevant to the noise aspect of social surroundings and have informed planning for the Proposal (Table 6.14).

Table 6.14 Noise policy and guidance

Author	Title	Year of publication
EPA	Statement of Environmental Principles, Factors and Objectives (EPA, 2020b)	2020
EPA	Environmental Factor Guideline: Social Surroundings	2016
DWER	Draft Guideline on Environmental Noise for Prescribed Premises	2016[14]
Government of Western Australia	Environmental Protection (Noise) Regulations 1997	2015

The Environmental Protection (Noise) Regulations 1997 (Noise Regulations) prescribe standards under the EP Act setting the maximum allowable noise limits at receiving premises (assigned levels). For noise-sensitive premises (defined in Schedule 1 part C of the Noise Regulations), the allowable noise levels include an influencing factor calculated from the land use within 100 m and 450 m radius from the noise emitting premises. Industrial and utility premises in the KIA are also subject to specific assigned levels in recognition of the unique factors of the area.

The outdoor noise levels assigned in the Noise Regulations are presented in Table 6.15.

Table 6.15:Assigned outdoor noise levels

Type of premises receiving noise	Time of day	Assigned level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90
Industrial and utility premises in the Kwinana Industrial Area	All hours	75	85	90

[14] An updated draft guideline has since (May 2021) been released and is currently open for consultation (closed 10 September 2021).

The L_{Ax} is the noise level that is exceeded for x% of the time, i.e., L_{A10} is the noise level exceeded for 10% of the time. The L_{AMAX} is the maximum noise level recorded.

In addition to the above-assigned levels, it is a requirement under the Noise Regulations that noise should be free of annoying characteristics (i.e., tonality, impulsiveness, and modulation). Should these characteristics be present, then adjustments are made to the measured or predicted level at the receiving premises for the purposes of assessment. These adjustments are cumulative to a maximum of 15 dB (Table 6.16).

Table 6.16: Adjustments for annoying characteristics where noise emission is not music

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB

6.5.3 Receiving environment

6.5.3.1 Sensitive receptors

Nearby sensitive receptors are situated in residential developments in an arc from the east around to the southwest of the site. The nearest sensitive receptors are 3 km to the east in Medina. The location of the key sensitive receptors is illustrated in Figure 2.4.

The near field environment comprises industrial premises, with the BP Refinery directly adjacent to the boundary of the Proposal.

6.5.3.2 Existing noise levels

Sound levels are periodically measured along the northern boundary of CSBP Kwinana to verify that noise emissions remain compliant at the adjacent industrial premises. Measured noise levels at the common boundary with the BP Refinery were no greater than 70 dB L_{A10} , which, when adjusted by +5 dB(A) for 'tonal characteristic', meets the assigned level in the Noise Regulations for industrial receptor premises of 75 dB L_{A10}.

The nearest residential premises to the east at Medina are exposed to general noise emissions from the KIA and local traffic. Noise from traffic and other transport activity is not assessable under the Noise Regulations.

Worst-case conditions for noise impacts occur where there is a temperature inversion in conjunction with light winds in the direction of the receiver, resulting in effective sound propagation in that direction. The Kwinana area is bounded by the ocean to the west; observations over the last twenty years have shown that temperature inversions can occur during periods of light easterly winds during cold nights (Herring-Storer, 2021)

Temperature inversions with light westerly winds which would carry noise towards Medina do not appear to occur. This is possible because light westerly winds are not common (typically westerly winds are moderate to strong), and the westerly airstream is warmed by the ocean; therefore, conditions for temperature inversions are less favourable.

Despite the favourable prevailing meteorology, an assessment by Kwinana Industries Council in 2019 reported cumulative noise levels from the KIA recorded at the nearest residential area to the east in Medina do sometimes exceed the allowable night-time assigned level of 35 dB L_{A10} (Herring-Storer, 2021).

6.5.4 Potential environmental impacts

The Proposal has the potential to impact social surroundings via emissions of noise with the potential to impact nearby industrial and residential receptors.

Noise levels during the construction phase of the Proposal, expected to be conducted within the "weekday" period defined in the Noise Regulations, will be required to be managed in accordance with the assigned levels.

Sources and sound power levels predicted for the Proposal during the operational phase, based on measurements of the existing ammonia plant, are presented in Table 6.17.

Table 6.17: Noise source sound power levels

Proposal Noise Sources	Sound Power Level, dB(A)
CO_2 discharge pipe outlet	107
Compressor Motor (within partially open building)	113
Compressor (within partially open building)	115
Cooling Tower	106
Deaerator	108
Pumps	110
Electrolyser	73

6.5.5 Mitigation

Noise mitigation measures, such as stack silencers, acoustic lagging and attenuators, which have been implemented in the existing ammonia plant are to be incorporated into the Proposal.

Furthermore, an environmental noise assessment (Appendix D) has determined that the installation of an acoustic barrier will ensure the assigned noise level is not exceeded at the industrial property adjacent to the Proposal (Illustrated in Figure 6.7).

6.5.6 Assessment and significance of residual impacts

An environmental noise assessment has been carried out for the Proposal (Herring Storer 2021; Appendix D). Noise levels were predicted using the acoustic software "SoundPlan" for worst-case wind conditions during night-time operation (in accordance with DWER draft Guideline on Environmental Noise for Prescribed Premises (May 2016)). The L_{A10} assigned level is the most critical assessment criteria at the receptor locations.

Near-field modelling of the Proposal was carried out in conjunction with existing noise sources at CSBP Kwinana in order to determine the impacts on neighbouring industrial premises.

The Proposal is predicted to comply with the L_{A10} assigned level for the KIA at the boundaries of the adjacent premises, with the addition of a section of acoustic barrier wall (Figure 6.7).

The acoustic barrier wall will be located on or near the boundary with the BP Refinery, extending north of the nearby southeast corner of the refinery. The barrier wall will be 2.4 m in height and 30 m in length. The acoustic barrier wall is required to ensure that local cumulative noise emissions do not exceed 70 dB(A) within the neighbouring BP Refinery premises, and thus after adjustment of +5 dB(A) for tonal characteristics will comply with the 75 dB L_{A10} assigned level.

The predicted noise emissions from the Proposal presented in Table 6.18 are all below the assigned noise level of 35 dB(A) at residential receptor areas.

Table 6.18: Predicted noise emissions at residential receptors

Receptor	Proposal predicted dB L_{A10}	Compliance status at night-time
R1 - North Rockingham	19	Compliant
R2 – Hillman	16	Compliant
R3 – Leda	22	Compliant
R4 – Calista	24	Compliant
R5 – Medina	22	Compliant

Noise contours for the Proposal are presented in Figure 6.8.

The predicted noise emissions from the Proposal have been added to the KIC 2019 predicted night 'worst case' noise emissions for the cumulative assessment. In the case of many receptors surrounding the KIA, the current cumulative noise levels, without the addition of the Proposal emissions, can exceed the assigned level under maximum propagation climatic conditions. These

conditions occur infrequently, and for most of the time, the cumulative noise emissions are less than the worst-case scenario.

However, the noise assessment has shown that noise emissions from the Proposal will be more than 5 dB(A) below the assigned level at sensitive receptors demonstrating compliance with the Noise Regulations. The contribution of the Proposal to cumulative noise emissions is considered insignificant, with noise levels dominated by existing sources in the KIA.

6.5.7 Environmental outcome

The environmental noise assessment indicates that the noise from the Proposal will not significantly affect social surroundings and that the EPA's objective will be met.

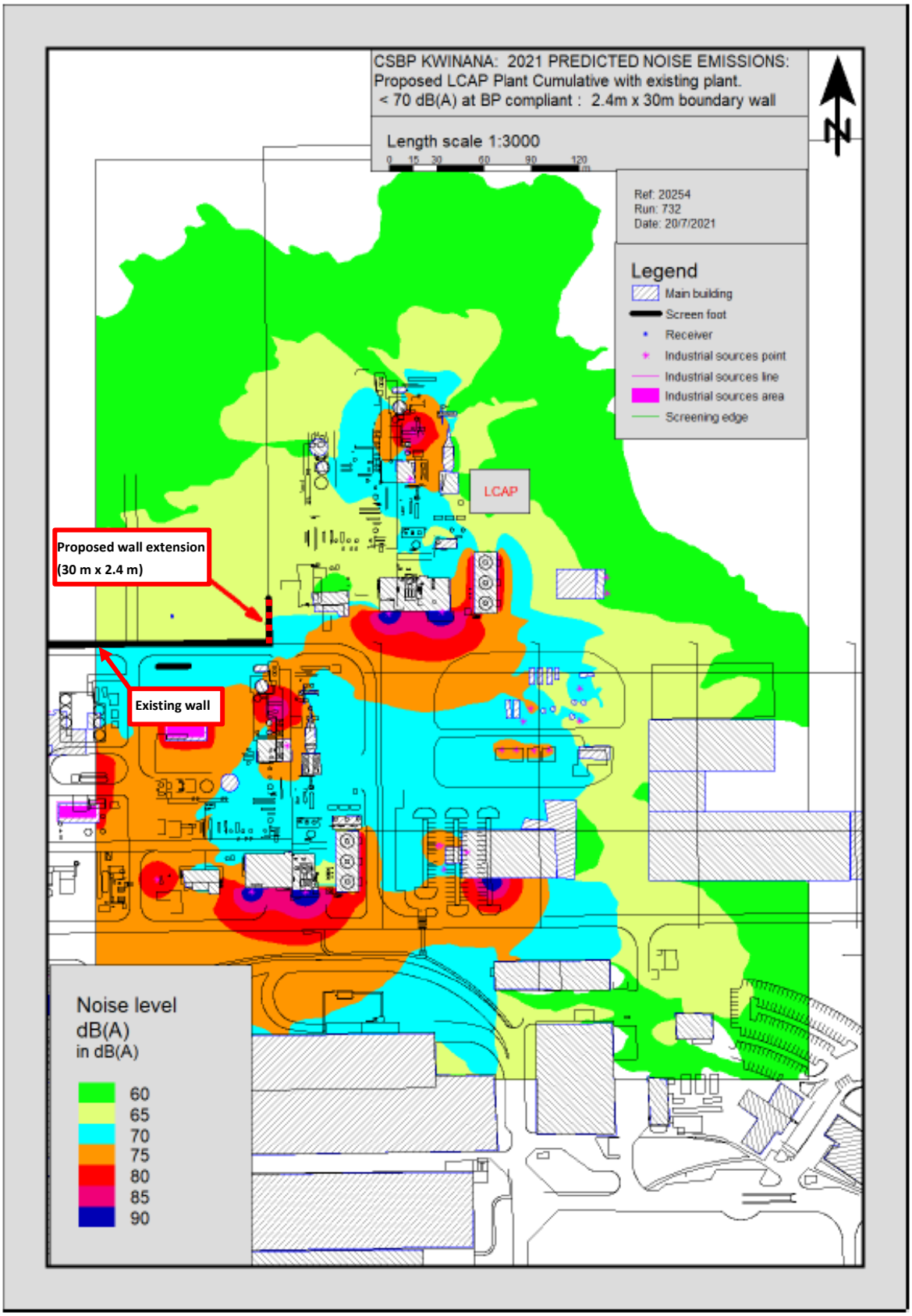

Figure 6.7: Near field predicted noise emissions with acoustic boundary wall

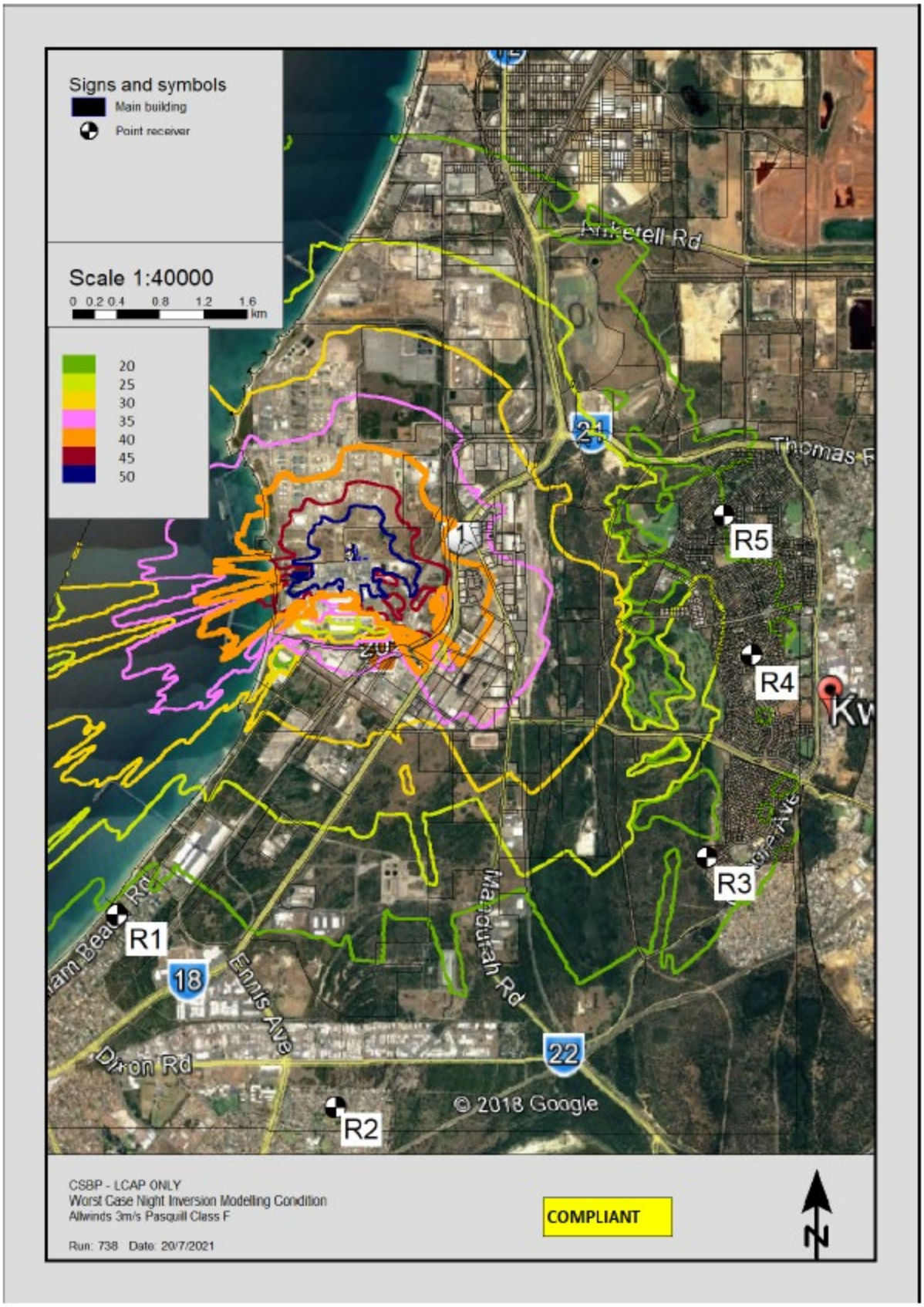

Figure 6.8: Predicted Proposal noise emission contours

7. Other environmental factors

The identification of environmental factors (Section 6.1) established several other environmental factors to be considered for the Proposal in addition to Marine Environmental Quality, Air Quality, Greenhouse Gas Emissions and Social Surroundings, being:

- Marine Fauna;
- Benthic Communities and Habitat;
- Human Health;
- Inland Waters;
- Flora and Vegetation; and
- Terrestrial Fauna.

The Proposal is considered unlikely to result in a significant environmental effect to the above environmental factors and, therefore, they have not been subject to detailed environmental assessment in this referral supporting information document.

However, whilst noting this, Table 7.1 provides a summary assessment of how these other environmental factors have been considered for the Proposal.

Table 7.1: Assessment of other environmental factors

Environmental factor	EPA objective and guidance	Receiving environment	Potential environmental effect	Management and predicted outcome
Marine Fauna	EPA objective: *"To protect marine fauna so that biological diversity and ecological integrity are maintained."* EPA guidance: • Environmental Factor Guideline: Marine Fauna (EPA, 2016e)	Cockburn Sound contains seagrasses which are primary producers providing habitat for many organisms supporting numerous food chains. The depth of Cockburn Sound and its degree of shelter from ocean swell make it the most intensively used marine embayment in Western Australia. Consequently, Cockburn Sound experiences influences from fishing, recreation, waste disposal, industry shipping and naval activities.	Generation of liquid wastes requiring disposal to the marine environment via the SDOOL with potential to reduce marine water quality with indirect impacts to marine fauna and benthic communities and habitats.	Discharge to SDOOL will be in accordance with current regulatory requirements specified in the EP Act Licence and will be managed through the implementation of the established Wastewater Management Plan and Liquid Waste Management Plan. The quality of wastewater currently discharged to the marine environment is not expected to change; therefore, no impacts on the quality of marine waters are expected. No significant residual direct or indirect impacts have been identified; therefore, it is considered that the EPA's environmental objectives will be met.
Benthic Communities and Habitat	EPA objective: *"To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained."* EPA guidance: Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016a)			
Human Health	EPA objective: *"To protect human health from significant harm."* EPA Guidance: • Environmental Factor Guideline: Human Health (EPA, 2016c)	Nearby sensitive receptors include residential developments, recreational facilities, a childcare facility, and a school (Figure 2.4). The location of these sensitive receptors is in the suburbs of North Rockingham, Leda, Calista, and Medina.	Human health could be impacted by air emissions and noise generated by the Proposal. The Proposal in conjunction with the existing CSBP Kwinana complex also presents a safety risk to residential, sensitive, commercial, or active open space areas, predominantly from the storage of 40,000 tonnes of liquid ammonia at minus 33 °C, at atmospheric pressure.	Assessment of air emissions under the key environmental factor of Air Quality, and noise under the key factor of Social Surroundings, confirmed that these emissions are not likely to result in unacceptable impacts at the receiving locations. The Proposal requires no changes to the existing liquid ammonia storage facilities at CSBP Kwinana. A review of the Quantitative Risk Assessment (QRA) conducted for CSBP Kwinana concluded that, whilst the Proposal does result in an increase in the cumulative fatality risk of the site, the increase does not impact residential, sensitive, commercial, or active open space risk criteria (Risk Consult, 2021). Therefore, it is determined that the EPA's objective for Human Health will be met.

Environmental factor	EPA objective and guidance	Receiving environment	Potential environmental effect	Management and predicted outcome
Inland Waters	EPA objective: *"To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected."* EPA Guidance: • Environmental Factor Guideline: Inland Waters (EPA, 2016d)	The geology beneath the Proposal supports a number of aquifers in the superficial and deeper formation. Groundwater is abstracted from the aquifers for beneficial (industrial) uses, including by CSBP. There are no natural surface watercourses or wetlands in the Development Envelope. Stormwater is collected, and the runoff is directed to the CSBP Kwinana liquid effluent system.	The release of contaminants into surface water or groundwater has the potential to impact the environment through the reduction of water quality. Abstraction of groundwater for the Proposal has the potential to reduce levels in underground aquifers and to allow saline water intrusion and/or impact groundwater-dependent ecosystems.	The Proposal is located within CSBP Kwinana and the existing groundwater monitoring area. The Proposal will be fully contained (bunded), and no discharges to inland waters (including groundwater and surface waters) will occur. The Proposal does not include an increase or change to the ammonia product to be stored on-site; therefore, the risk and consequence of a spill will remain unchanged. Water abstraction will continue to be within the currently licenced allocation and managed through CSBP's Groundwater Operating Strategy. Consequently, the EPA's objective will be met.
Flora and Vegetation	EPA objective: *"To protect flora and vegetation so that biological diversity and ecological integrity are maintained".* EPA guidance: • Environmental Factor Guideline: Flora and Vegetation (EPA, 2016b)	The Proposal is in an extensively cleared area with some remnant and regrowth vegetation. Vegetation in the Development Envelope is in a degraded condition with severely disturbed structure. The vegetation is unlikely to provide any suitable habitat for priority flora and is not representative of TECs or PECs.	The Development Envelope is primarily cleared and comprises existing hardstand or area previously cleared for fire hazard protection. Less than 1 ha of clearing is required for the Proposal. The Development Envelope comprises part (20.62 ha) of a larger 25.78 ha area previously approved specifically for hazard reduction clearing (slashing of understorey) under Clearing Permit 7390/1 (Appendix A). DWER previously determined that clearing for hazard reduction was not likely to be at variance to any of the clearing principles. Analysis of the proposed clearing (all vegetation) against the clearing principles is included in Appendix A.	No significant loss of remnant vegetation will occur (less than 1 ha of clearing). Other vegetation disturbance will be within areas already cleared for hazard reduction purposes. No significant residual impacts have been identified; therefore, it is considered that the EPA's objective will be met.

Environmental factor	EPA objective and guidance	Receiving environment	Potential environmental effect	Management and predicted outcome
Terrestrial Fauna	EPA objective: *"To protect terrestrial fauna so that biological diversity and ecological integrity are maintained."* EPA guidance: • Environmental Factor Guideline: Flora and Vegetation (EPA, 2016f)	The Proposal is in an extensively cleared area with some remnant and regrowth vegetation. The vegetation may provide some suitable habitat for Quenda, and a stand of Tuart trees was noted as potential foraging habitat for black cockatoos.	The Development Envelope is primarily cleared and comprises existing hardstand or area previously cleared for fire hazard protection. Less than 1 ha of clearing is required for the Proposal.	The Proposal will not result in the loss of potential cockatoo foraging trees and is not likely to impact the conservation status of Quenda given the small amount of clearing required and the condition of vegetation. No significant residual impacts have been identified; therefore, it is considered that the EPA's objective will be met.

8. Holistic impact assessment

This referral supporting information document details the EIA carried out for the Proposal. The Proposal's impacts have been assessed individually against the key environmental factors in consideration of the EPA's objectives and relevant policy and guidance (Section 6). An evaluation of the other environmental factors (i.e., those not considered key factors for the assessment) has also been carried out (Section 7).

Connections and interactions between the different parts of the environment inform a holistic view of the potential impacts.

Figure 8.1 illustrates the key relationships and links between the environmental factors and values that the Proposal may impact.

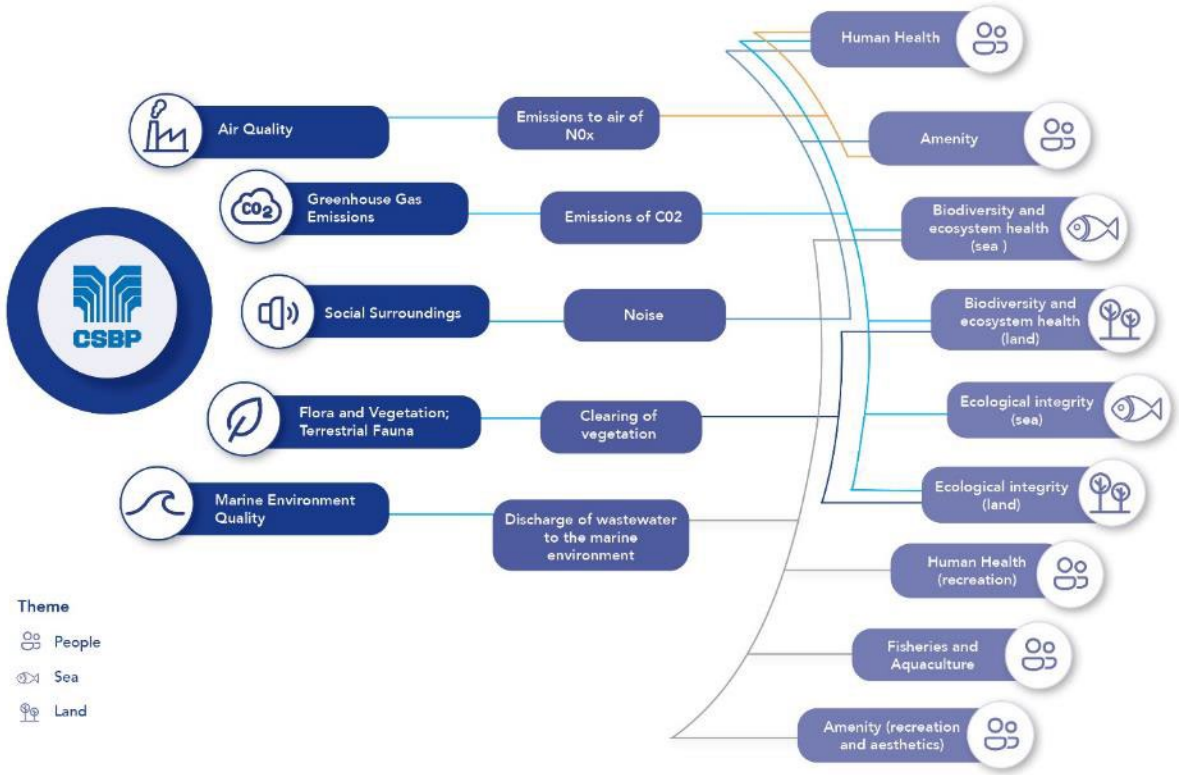

Figure 8.1: Intrinsic interactions between environmental factors and values

The holistic assessment demonstrates that several environmental values can be impacted by multiple factors associated with the Proposal.

People working and living near the Proposal may have their health and amenity impacted by air and noise emissions from the Proposal. However, it is unlikely that air and noise emissions will combine to make the resultant impact unacceptable as each impact will mainly impact different values (i.e., air emissions – air quality and human health; noise – amenity).

Discharges of treated wastewater to Cockburn Sound will primarily result in potential impacts to marine environmental quality. Changes to marine environmental quality could in turn impact values associated with:

- Biodiversity, ecological health, and integrity of the marine environment (including benthic communities and habitats and marine fauna); and

- Human health, amenity and economic values associated with people using the sea for recreation, swimming, and fishing.

By managing the potential impacts on marine environmental quality, it is considered that the other values can also be protected.

The environmental factor of GHG emissions has potential connections with several environmental values, including human health and biodiversity, ecosystem health, and land and sea integrity. While there is an established link between GHG emissions and climate change risk, it is not possible to directly link GHG emissions from the Proposal to any specific environmental harm or impacts. Notwithstanding this, the potential impacts have been assessed, and mitigation measures proposed that will reduce GHG emissions from the Proposal over time, thus minimising impacts on other environmental values.

8.1 Summary

The mitigation hierarchy (avoid, minimise, rehabilitate, offset) has been applied to all potential environmental impacts, and the EIA has informed the Proposal design. The proposed mitigation measures mean that the inter-related impacts to environmental values can be adequately managed.

When the separate environmental factors affected by the Proposal are considered together in a holistic assessment, it is concluded that there will be no significant residual impact. All relevant EPA objectives can be met, consistent with the assessment of the individual factors in Sections 6 and 7.

9. Cumulative environmental impact assessment

The cumulative impacts of the Proposal have been considered under each factor. The below summarises those potential impacts including commentary on mitigation measures, where applicable, to reduce potential cumulative impacts.

The marine environmental quality could suffer cumulative impacts from the discharge of wastewater from multiple operations. All discharges via the SDOOL are subject to meeting the conditions of individual EP Act licences which are set with consideration of the cumulative impacts of the total SDOOL discharge. Discharge of wastewater associated with the Proposal will remain within currently licensed limits therefore, cumulative impacts to marine environmental quality are not expected to change.

Cumulative impacts to air quality have been accounted for by the addition of background NOx concentrations measured in 2020 at the nearby DWER Rockingham station to modelled ground level concentrations (Section 6.3.4). The 75th percentile was selected as the background concentration and is considered conservative due to the 2021 closure of the BP refinery which previously contributed 34% of airshed NOx (according to 2020/2021 NPI data). The cumulative ground level concentrations were found to be below the NOx NEPM criteria at all locations, with the maximum concentrations reaching 57% and 38% of the hourly and annual guideline criteria respectively, predicted close to the site boundary. At sensitive receptors predicted NOx concentrations were up to 27% of both the hourly and annual NOx criteria.

Despite being a small contributor to total global GHG emissions (Section 6.4.4.4) the direct and indirect emissions associated with the Proposal will contribute to the cumulative impact. Thus, an emissions reduction program will be implemented to attain net zero by 2050.

The noise assessment considered cumulative emissions both near and far field (Section 6.5.4). Cumulative noise emissions have the potential to exceed the noise criteria at the neighbouring industrial premises (BP refinery). Implementation of an acoustic barrier to mitigate the noise at the boundary will ensure assigned levels can be met. Prior to the addition of the proposal under worst case propagation conditions cumulative noise from sources within the KIA has been determined to occasionally exceed assigned levels in the nearest residential areas to the east. Contribution of the proposal has been found to be more than 5 dB(A) below assigned levels therefore the proposal is not expected to make a significant contribution to the cumulative noise at nearby sensitive receptors. Therefore, the cumulative impacts are predicted to remain unchanged.

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Appendix A Clearing permit

Appendix B Air Quality Assessment

Appendix C Greenhouse Gas Management Plan

Appendix D Noise Assessment